

with rarely fine, commonly thickened fibrous roots, perennating by axillary lateral buds. Foliage externally smooth to variously papillose or tuberculate, rarely scabro-ciliate or ciliate, the leaves frequently dimorphic, those of rhizome or early rosettes either scalelike or subulate, the principal ones polystichously arranged, with bases typically open-sheathed, the sheaths broadly clasping, the blades variously linear-triangular or linear, flat, angled or lingulate, usually narrowly acute, at apex frequently and eccentrically or symmetrically aristate or conic-subulate. Inflorescence a single sessile flower or 2 or more flowers in spikes and sessile or (commonly) the flowers in spikes raised and terminal on scapes, the spikes either single and terminal or clustered and terminal or (rarely) terminal on branches of a branched inflorescence, the scape itself either naked or usually with 1 or more pairs of subopposite, sessile, erect, leafy but mostly short, bracts. Spike bracts paired at spike base, spirally arranged upward, or all spike bracts spirally set, all fertile or the lowermost 1(-2) sterile, mostly glumaceous, usually rigid and lanciform-navicular with thickened dorsal areas and broad, mostly entire, scarious borders, apically frequently produced into stiff mucros, cusps, or subulation. Sepals 2-3, often similar to fertile bracts, rarely 3 and subequal, more often with 2 (the laterals) thinner with narrower, thickened curvate-keeled backs and subopposite, the third (inner) sepal reduced, usually

of different design and still thinner, or entirely lacking. Petals 3, equal, the corolla salverform, the tube variously elongate, the 3 lobes broad, blue, lavender, or white, ephemeral. Stamens 3, the short filaments adnate near base of petal blades and opposite them, shorter or longer than anthers, flat or terete, the anthers mostly narrow, tetrasporangiate and bilocular, the locules with bases variously divergent on a broadened, flattened connective. Staminodia 1-3, variously reduced, or lacking (the common condition). Ovary trilocular, the placentation axile, the ovules usually numerous, the style typically elongate, wing-angled at or toward the base and (except in complex including species 8 and 9) bearing 2-3, usually pendent, less often erect, claviform appendages, at apex with 3, usually distally dilated and flattened, stigma branches, these variously divided and fimbriate. Capsules loculicidal, the 3 valves firm, mostly much thickened at the crested, lobed or toothed apex. Seeds usually tumid and irregularly obovoid, mostly 0.5-1 mm long, short-apiculate or umbilicate, the broad body dark, spirally longitudinally coarsely ribbed, frequently with strong irregular cross-ridges.

Distribution. Neotropical plants of boggy warm or cool habitats, centering in the savannas of northern South America but with two taxa extending south to the southern Brazilian planalto, one into Paraguay.

KEY TO SPECIES OF *ABOLBODA*

In this key priority is given to vegetative characters (rosette leaves, rootstocks, scapes, and bracts) and easily observed externals of spikes (sterile and fertile bracts, sepals). The key applies only to normal, healthy growth in flowering or fruiting condition. Features involving more dissection (floral parts from the corolla inward, fruit, seed) perhaps deserve more emphasis than they get here, but the average *Abolboda* specimen often is quite limited in some or all of these structures. A suggestion to collectors is that they make more effort to gather extra spikes, thereby increasing the value of the collection exponentially. The best characters are yet to be explored sufficiently and thus are used here with some reservation. It is recommended to check these features against the species treatments and their accompanying figures.

- 1a. The plants e-scapose, the spikes sessile with basal bracts forming part of the involucre; leaves usually less than 4 cm long.
 - 2a. Rosette leaves mostly uniform, smooth, gradate only in size, with bases tightly imbricate in high spirals on elongate stems, the longest ones toward and at shoot tip, narrowly linear-triangular, stiff, tapering gradually, with an arista at apex at least 1 mm long; flowers mostly 2-4 per spike, the corolla pale blue; stylar appendages short-stalked, often erect, broadly clavate-spathulate; sepal keels smooth 1a. *A. acaulis* var. *acaulis*
 - 2b. Rosettes often dimorphic or of 2 sorts of leaves, one type with stubby fleshy angulate, blunt and often papillose linear blades (mostly less than 1 cm long), the others longer, broader-based (with narrower, more tapering blades), sometimes aristulate or aristate; flowers 1-2 per spike, the corolla pale blue or white; stylar appendages longer-stalked, mostly reflexed, narrowly claviform; lateral sepals often with papillose keels 2. *A. killipii*
- 1b. The plants scapose, the scapes sometimes shorter than the principal leaves but mostly projecting the spikes beyond them; leaves various in shape and size.
 - 3a. Scapes ebracteate (exclusive of those at very base of scape) or if bracteate, the bracts a single pair (rarely 2 pair) at or near the scape summit.
 - 4a. Plants with comparatively coarse foliage, the principal leaves over 15 cm long, their blades 3-5 mm wide; spikes (excluding involucre) 1.5-2.5 cm long; perennials with stout, short rhizomes.

- 5a. Inflorescence overtopped by longer leaves, these with strongly thickened, pale, cartilaginous margins; spike bracts and sepals strongly excurved; scape bracts mostly ca. 2 cm long, inserted 5–20 mm below spike base; stylar appendages with basal auricles 3. *A. bella*
- 5b. Inflorescence overtopping longer leaves, the leaf blades lacking strongly thickened, pale cartilaginous margin; spike bracts and sepals not excurved; scape bracts 3–7 cm long, inserted 0–40 mm below spike, in either case making a leafy involucre; stylar appendages lacking auricles 4. *A. sprucei*
- 4b. Plants with comparatively fine or short leaves, these rarely over 11 cm long, their blades less than 3 mm thick or wide; spikes 0.5–1.5 cm long; perennials or short-lived perennials or annuals.
- 6a. Perennials with firm leaves and linear scapes.
- 7a. Scapes 2 or more times longer than principal leaves; tips of capsule valves bifid-toothed; stylar appendages pendulous.
- 8a. Lower spike bracts exceeding, rarely equaling, the rest of the spike; longer leaves over $\frac{1}{2}$ as long as scape; lateral sepals narrowly acute, mostly overtopped by tips of subtending bract; stylar appendages exauriculate 5a. *A. ebracteata* var. *ebracteata*
- 8b. Lower spike bracts shorter than the rest of the spike; longer leaves up to $\frac{1}{2}$ as long as the scape; lateral sepals broadly and bluntly acute, their tips equaling or surpassing tips of subtending bract; stylar appendages auricled 5b. *A. ebracteata* var. *brevifolia*
- 7b. Scapes barely if at all overtopping principal leaves; tips of capsule valves shallowly bilobed, not toothed; stylar appendages erect or ascending, not pendulous 1b. *A. acaulis* var. *scaposa*
- 6b. Annual or short-lived perennial, with soft, filiform, flat leaf blades and filiform scapes; sepals oblong or obovate, obtuse, often retuse and mucronate 6. *A. americana*
- 3b. Scapes with 1 or more pairs of scape bracts, at least one of these pairs at or toward middle of scape.
- 9a. Spikes solitary and terminal at scape tips or at tips of scape branches.
- 10a. Fertile flowers 4 or fewer per spike (reduced, probably sterile florets may be produced internal to the fertile ones); spikes to 1.5 cm long.
- 11a. Scape bracts in 4 or more pairs; bract tips remaining erect, thus fruiting inflorescence narrowly ellipsoid; sepals always 3, lacking evident keel, subequal in length but the inner one strongly stipitate.
- 12a. Inflorescence much branched, the spikes terminal on the elongate branches; style base appendaged 7. *A. paniculata*
- 12b. Inflorescence not branched or with one short branch from the penultimate node or the second spike sessile there; style base in *A. uniflora* not observed (but condition assumed to be the same).
- 13a. Leaves tapering gradually from base to tip, thus linear-triangular, the blades flattened and with conic-subulate, even aristate, tips 8. *A. neblinae*
- 13b. Leaves narrowed above clasping base, not tapering-bladed, the blades narrowly linear, thickened, their tips with an eccentric apiculus 9. *A. uniflora*
- 11b. Scape bracts nearly always in 3 or fewer, usually 1, rarely 2–3, pairs; bract tips ascending or spreading, the spikes typically broadly ellipsoid or ovoid to turbinate or hemispheric; sepals mostly 2, lateral and strongly keeled, the inner sepal if present much shorter and thinner.
- 14a. Spike bracts prevalently ovate, abruptly blunt-mucronate; tips of lateral sepals conspicuously projected beyond tips of subtending bracts.
- 15a. Spikes broadly turbinate, the sepals strongly bowed outward beyond the bract tips; leaf blades strongly flattened, mostly (1.5–)2 mm or wider, uniformly nerved abaxially; scapes barely overtopping longer leaves 10. *A. abbreviata*
- 15b. Spikes narrower, mostly ovoid to ellipsoid, the sepals more erect in orientation; leaf blades with midnerve strongest abaxially; scapes usually at least twice as long as longer leaves.
- 16a. Rhizome usually producing a stubble of short-stubby-leaved rosettes, and longer-leaved floriferous rosettes; longer leaves with costa strongly raised abaxially, the blades silvery green; stylar appendages narrowly claviform, exauriculate 11. *A. eglerti*
- 16b. Rhizome with or without dimorphic-leaved rosettes; longer leaves with costa level or slightly raised abaxially, the blades not silvery green; stylar appendages broadly clavate, mostly auriculate 12. *A. pulchella*
- 14b. Spike bracts prevalently lanciform, more taper-tipped, mucronate or cuspi-

- date; tips of lateral sepals mostly not projecting beyond tips of subtending bracts, at most equaling them.
- 17a. Leaves and/or scapes liberally frosted with prominent tubercles, thus tuberculate-scabrid and also often rugose; leaves essentially monomorphic, these and bracts with blunt, callused tip bearing a small eccentric mucro.
- 18a. Leaves and scapes tuberculate-rugose; keel of both bract and sepals scabridulous from middle to tip; bifurcate staminodia present 13. *A. scabrida*
- 18b. Only scapes tuberculate-rugose; keel of bract and sepals smooth or nearly so; staminodia not evident 14. *A. dunstervillei*
- 17b. Leaves and/or scapes smooth or no more than papillate-granular; leaves of a tuft mostly dimorphic, these and bract apices more tapering, often spinulose-tipped.
- 19a. Leaf blades smooth, most of the principal ones subulate-setose-tipped; spike bracts > 1 cm long, spinulose at tip; stylar appendages raised well above the ovary apex 15a. *A. acicularis* var. *acicularis*
- 19b. Leaf blades or most of them granular-papillose, also often rugulose, averaging wider, with blunter tips, these apiculate or aristulate; spike bracts no longer than 1 cm, aristulate or apiculate; stylar appendages basal and erect 15b. *A. acicularis* var. *granularis*
- 10b. Fertile flowers 5 or more, usually many, per spike; spikes at least 1.5 cm long.
- 20a. Spikes broadly ellipsoid to ovoid or globose to hemispheric, the sepals (except in no. 16) strongly exerted and attenuate to sharply acute or with keel excurrent as cusp or arista.
- 21a. Scape bracts 1 pair; leaf blades <5 mm wide.
- 22a. Leaf sheaths long-ciliate; leaf blades scabro-ciliate; sepals about as long as subtending bracts or shorter; staminodia present; stylar appendages without basal auricle 16. *A. ciliata*
- 22b. Leaf sheaths and blades entire; sepals much longer than subtending bracts; staminodia lacking; stylar appendages with basal auricles.
- 23a. Flowering in morning; larger leaves 3-10 cm long 17a. *A. poarchon* var. *poarchon*
- 23b. Flowering in afternoon; larger leaves prevalently >10 cm long 17b. *A. poarchon* var. *intermedia*
- 21b. Scape bracts 2 or 3 pairs (rarely 4); leaf blades mostly <5 mm wide; sepal tips much exerted.
- 24a. Lowest (largest) pair of scape bracts mostly 2-3(-3.5) cm long; spikes broadly ovoid to hemispheric or subglobose, rarely >2 cm long 18a. *A. grandis* var. *grandis*
- 24b. Lowest (largest) pair of scape bracts (3-)3.5-6 cm long; spikes broadly ovoid to ellipsoid or narrowly ovoid, mostly at least 2.5 cm long 18b. *A. grandis* var. *rigida*
- 20b. Spikes narrowly ellipsoid, narrowly lanceoloid or cylindric, the sepals blunt-tipped and slightly projecting beyond the erect, strongly imbricate subtending bracts.
- 25a. Leaves mostly linear-triangular to gladiate or linear-lorate, the blades tapering evenly to acute tips, thin-edged and plane, finely multinerved and comparatively smooth on both surfaces.
- 26a. Scapes with mostly 2(-3) pairs of bracts, these 1.5-3 cm long; plants mostly not >6 dm high 19a. *A. macrostachya* var. *macrostachya*
- 26b. Scapes mostly with 1(-2) pairs of bracts, these mostly 4-6 cm long; plants mostly 6-10 dm high 19b. *A. macrostachya* var. *robustior*
- 25b. Leaves narrowly linear, the tips blunt, the edges thick, the surfaces with few, coarse and raised nerves 20. *A. linearifolia*
- 9b. Spikes numerous, subsessile in glomerules at scape tip; fertile flowers not produced 21. *A. xglomerata*.

1. **Abolboda acaulis** Maguire, Bull. Torrey Bot. Club 75: 1. 1948. TYPE: Guyana. In white sand from conglomerate and sandstone, Kaieteur Plateau, British Guiana, 30 Apr. 1944, Maguire & Fanshawe 23096 (holotype, NY; isotypes, F, GH, K, US).

1a. **Abolboda acaulis** var. *acaulis*. Figure 1. Densely caespitose, smooth perennial, forming tight, dome-shaped cushions 4-5 cm high, these a compaction of ascending stems densely cloaked by tightly spirally imbricate chaffy old leaves, the roots

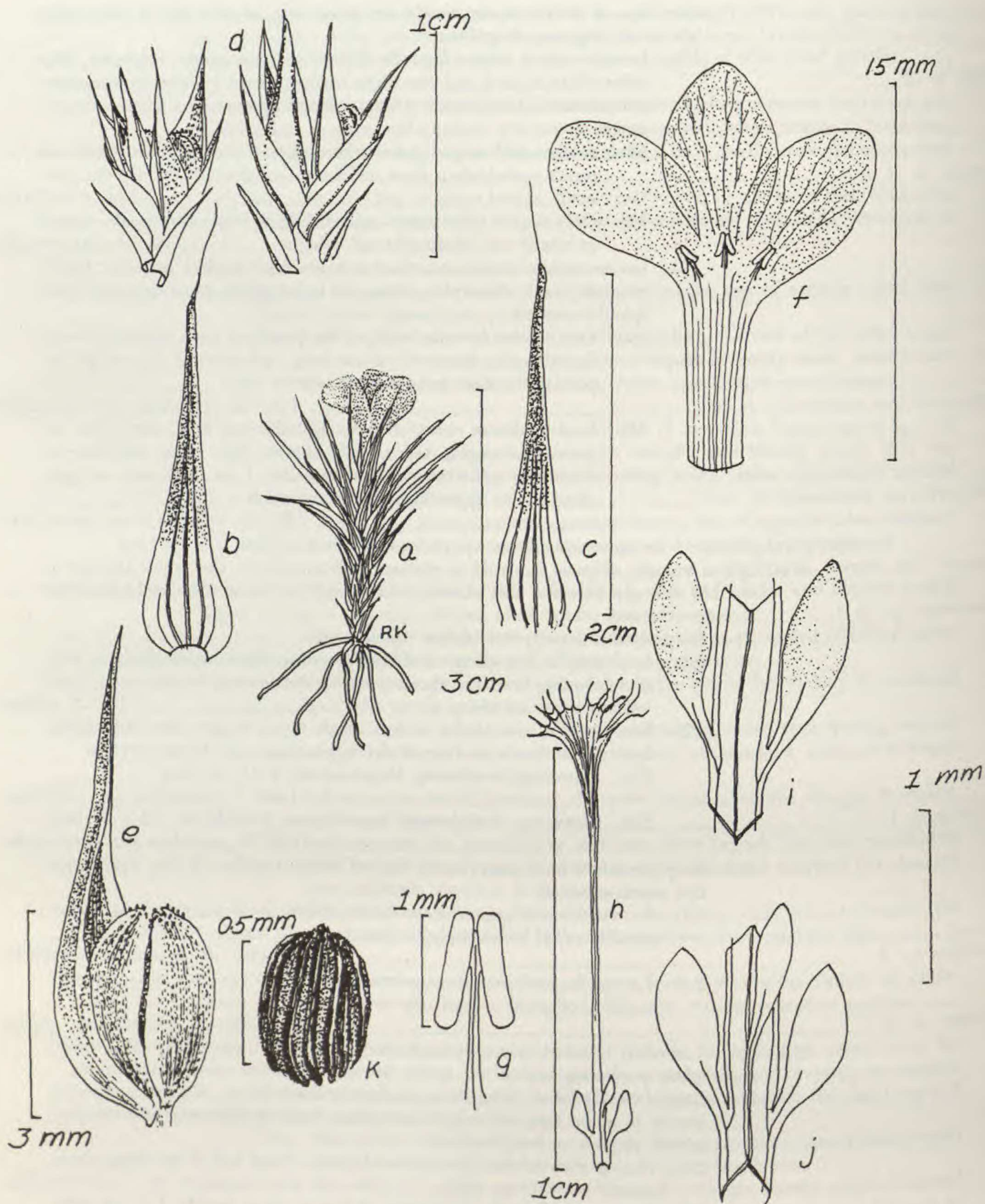


FIGURE 1. *Abolboda acaulis* var. *acaulis* (Steyermark et al. 12863).—a. Habit.—b. Leaf, adaxial side.—c. Leaf, abaxial side.—d. Two spikes.—e. Lateral sepal and capsule.—f. Corolla and stamens.—g. Stamen.—h. Stylar apparatus.—i. Style base showing lateral appendages.—j. Style base showing lateral appendages and adaxial appendage.—k. Seed.

spongy-thickened. Lower stem leaves shortest, narrowly triangular with setaceous tips, erect or ascending, 5–15 mm long, the upper gradually more spreading, broadly to narrowly triangular-linear, to 20(–30) mm long, the clasping base thin, pale, dilated, 2–3 mm wide, 3–11-nerved, narrowing gradually or abruptly to a thicker, narrowly linear-

subulate blade, this for most of its length flat or lingulate adaxially, convex and with 1–3 raised nerves abaxially, the tip usually narrow but blunt, obliquely spinulose-trichomiferous, the “spine” 1.5–3 mm long; inner leaves of rosette usually spreading or ascending, bent outward, those at base of spikelet buds abruptly shorter, thinner, and passing into

floral bracts, some also subtending initials for new rosettes. Spikes sessile or subsessile, (1-)2(-4)-flowered, the bracts and sepals stramineous, keeled; sterile bracts 1-3, broadly lanceolate or oblong-lanceolate, 5-6 mm long, acuminate, the lowest one shortest; fertile bracts mostly 2-3(-4), alternate-spiral, ca. 6 mm long with the innermost one often shorter and presumably subtending an aborted floret; sepals 2, rarely 3, the inner mostly aborted, the laterals slightly unequal, lanceolate, strongly keeled, 6-7 mm long, subequilateral, the bases broadly scarious-bordered, the blade narrowing and conduplicate toward apex; corollas salverform, pale blue, ca. 15 mm long, the tube ca. 6-7 mm long, the spreading lobes broadly ovate, 8-9 mm long, entire; stamens with anthers near-white, ca. 1 mm long, the two cylindrical locules joined by connective above middle, their bases divergent, on slender filaments ca. 1.5 mm long; stylar apparatus fully 1 cm long, slender, triquetrous at base with 3 ascending, claviform-spathulate appendages to 1 mm long, these distally thickened, the laterals slightly larger and set slightly below the anterior appendage, the style above becoming narrowly tubular, 3-lobed at the stigma, the broad, fimbriate-lacerate lobes forming a short funnel. Capsules oblong-obovoid, 2.5-3 mm long, the 3 valves thickened at the incurved-acute, sometimes slightly emarginate and always papillose-tuberculate tips. Seeds nearly round, 0.6-0.7 mm long, dark red-brown to nearly black, strongly and somewhat spirally 11-12-ribbed.

Distribution. Common in acidic, moist, rocky soil, medium to high elevations (200-2,400 m), usually savanna, from western Guyana west into Territorio Federal Amazonas in Venezuela.

Additional specimens examined. GUAYANA. Kaieteur Plateau, Cowan & Soderstrom 1814 (US); Soeschifhe, Cooper 292 (U); Imbaimadal, Maguire & Fanshawe 32167 (NY); Pakaraima Mts., Maguire & Fanshawe 32516 (F, NY); Upper Mazaruni River, Maguire & Fanshawe 32609 (K, NY, US); Mt. Ayanganna, Maguire & Fanshawe 40618 (GH, NY), 40669 (K, NY), Maguire & Fanshawe 40700 (GH, K, NY, US), 40701 (K, NY); Pakaraima Mts., Maguire 45917 (K, NY), Maguire et al. 46121 (NY, US), Maguire et al. 46916 (F, GH, NY); Kaieteur Falls, Prance 16558 (NY); Upper Mazaruni River, Tillett & Boyan 45227 (NY). VENEZUELA. TERRITORIO FEDERAL AMAZONAS: Río Coro-Coro, Holst & Liesner 3349 (MO, VDB); Cerro Sipapo, Maguire & Politi 27659 (NY, US), 27700 (F, K, NY), 27923 (NY, US), 28691 (NY); Cerro Huachamacari, Maguire et al. 30154 (NY); Río Manapiare, Maguire et al. 31703 (NY), 31773-A (NY); Serranía Yutajé, Maguire 35214 (NY), 35249 (NY); Cerro Huachamacari, Steyermark & Manara 2192. BOLIVAR: Kama-meru, Holst et al. 2192 (MO, VDB); Río Apongao, Huber & Alarcon 7443 (MYF,

VDB); Kavanayen, Huber & Alarcon 7718 (MYF, VDB); Chimantá Massif, Huber et al. 8853 (NY, VDB, VEN); Kavanayen, Huber & Alarcon 10578 (MYF, VDB); Salto Angel, Huber 11238 (MYF, VDB); Río Soruape, Huber 11837 (MYF, VDB); Meseta Guaiquinima, Huber & Rull 12256 (MYF, VDB); Kavanayen, Kral & Gonzalez 70414 (MO, NY, VEN, VDB), 70538 (MO, NY, US, VDB, VEN); Cerro Guaiquinima, Maguire et al. 32820 (F, NY, US); Ilu-tepui, Maguire 33179 (F, NY, US), 33730 (GH, NY); Chimantá Massif, Steyermark & Wurdack 457 (F, K, NY); Luepa, Steyermark & Nilsson 607 (NY); Aparaca-tepui, Steyermark 75784 (F, MO, NY, WIS); Auyan-tepui, Steyermark 93509 (F, K, NY, US, VDB), 116059a (F, MO); Guaiquinima, Steyermark et al. 117481 (MO), 117501 (MO); Cerro Marutani, Steyermark et al. 123872 (MO); Chimantá, Steyermark et al. 128089, 128683 (MO, VDB, VEN); Amuri-tepui, Steyermark et al. 123797; Acopan-tepui, Steyermark et al. 129926, 129977 (MYF, VDB, VEN).

This is one of the prettiest and most distinctive abolbodas of the Gran Sabana of Bolívar, Venezuela, and it is particularly abundant in and around rocky, wet, rapateaceous bogs, where it produces pale blue flowers year-round. Its commonest xyridaceous associates are *Orectanthe sceptrum*, *Xyris bicephala*, and *X. setigera*. Some of the larger clones are of considerable age, and the growth of these makes interesting study. Young plants may have a simple, single rosette with the leaves all spreading. As the plant grows older and into the first flowering season, buds form around spikes at rosette center and will be the shoots for the next flush of growth, then elongate to produce spirals of imbricate, short-triangular scale leaves that progressively elongate upstem to form successive flowering rosettes, and so on. The end result is a dome-shaped cushion of rosettes at tips of sometimes quite elongate, chaffy-cloaked stems. Other e-scapse abolbodas (*A. killipii*, extremes of *A. americana*), while often forming tight clusters of rosettes, appear not to have as much stem.

1b. *Abolboda acaulis* var. *scaposa* Kral, var. nov. TYPE: Venezuela. Bolívar: sandy seeps around rocks at edge of rapateaceous savanna by road, ca. 1.5 km E of Kavanayen, ca. 1,200 m, 27 July 1983, R. Kral with A. C. Gonzalez 70537 (holotype, VEN; isotypes, F, GH, K, MO, NY). Figure 2.

Ab *A. acaulis* var. *acaulis* foliis aliquantum longioribus (vulgo 3-5 cm longis), habitu breviscaposa differt.

Similar in habit to *A. acaulis* var. *acaulis* but coarser, stems typically shorter, though cloaked with short, triangular old leaves and their bases, or very short with all leaves in low, flat spirals, the short outer ones grading more abruptly into spreading rosette leaves; principal leaves rigid, spreading

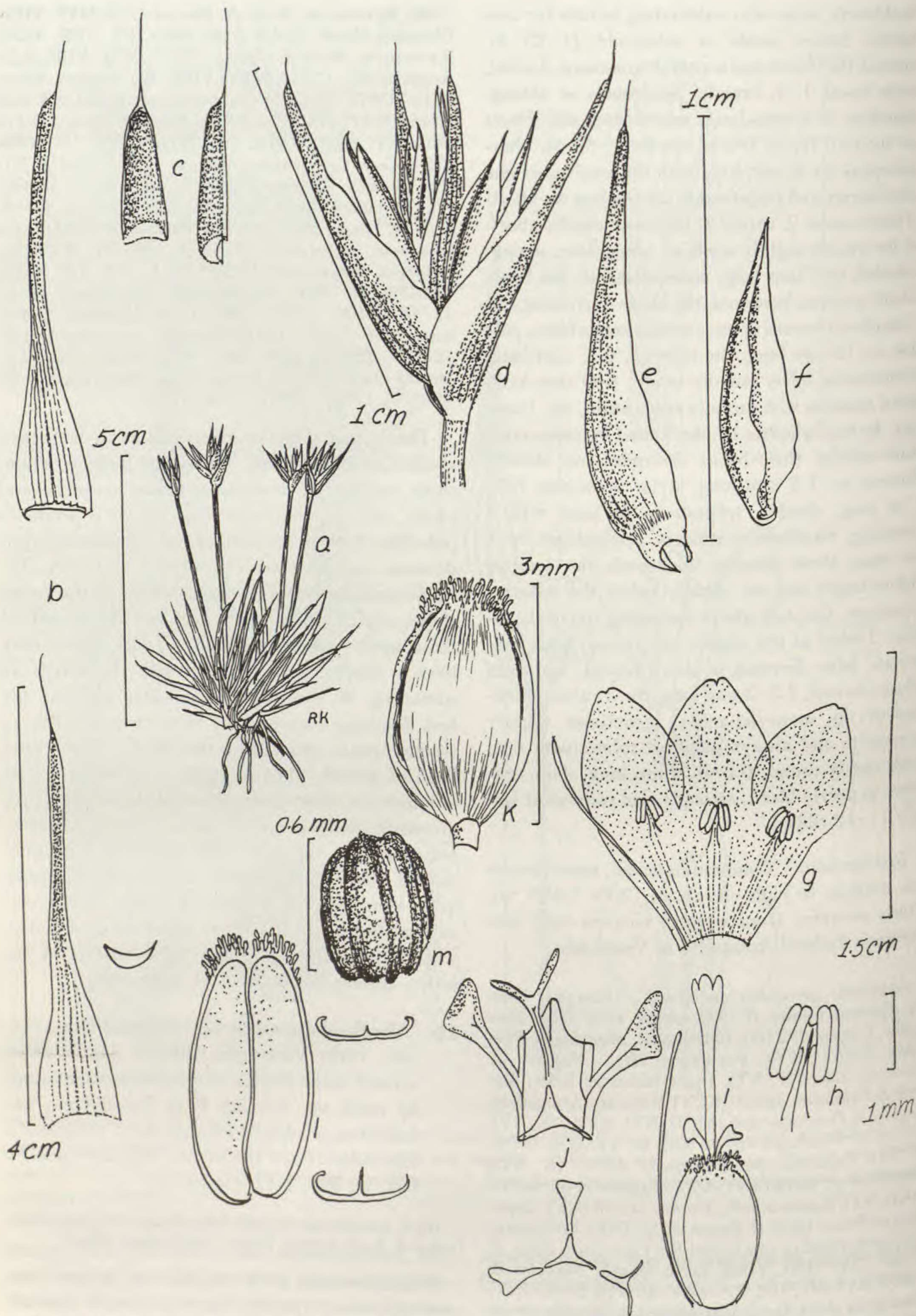


FIGURE 2. *Abolboda acaulis* var. *scaposa* (Kral & Gonzalez 70537).—a. Habit.—b. Leaf, adaxial side (above), abaxial side (below).—c. Leaf blade tip, adaxial side (left), side view (right).—d. Spike.—e. Lowest spike bract, side view.—f. Lateral sepal, side view.—g. Spread corolla showing stamens and a staminode.—h. Stamen.—i. Portion of excised gynoecium plus detached staminode.—j. Side view (above) and cross-sectional view (below) of styler base showing appendages.—k. Capsule.—l. Capsule valve showing median septum.—m. Seed.

or spreading-ascending, mostly 3–5 cm long, subulate-aristate-tipped as in the type variety. Scapes evident, erect or ascending, few to several per rosette, 0.5–4 cm long, shorter than leaves to slightly longer, stiff, 0.5–1 mm thick, oval or terete in cross section, ecostate, subtended by 2–3 keeled, lance-linear, subulate-tipped, broadly scarious-bordered bracts, the lowest shortest, the innermost 9–10 mm long; spikes turbinate, ca. 1 cm long, (2–)3(–4)-flowered, each flower subtended by a bract; bracts lanciform, 8–10 mm long, the lowermost longest, all with clasping bases, thickened, medially, 7-nerved, with strongly convex dorsal areas, broad, pale, scarious borders, and tapering to thickened, cusplike tips, these setose at tip; sepals 2, obliquely lateral, subequal, subequilateral, lanciform-navicular, 6–7 mm long, narrowly acute, the broad borders pale-scarious, the thickened carina curved, entire; corolla salverform, ca. 15 mm long, pale blue as in variety *acaulis* but sometimes with filiform-clavate staminodia attached low in the tube; anthers, gynoecium, and fruit essentially as in the type variety.

Distribution. Less common than the type variety, sometimes occurring with it in acidic, sandy, rocky soils, medium-to-high-elevation savanna (200–2,400 m), from Guyana west into Territorio Federal Amazonas, Venezuela.

Additional specimens examined. GUYANA. Pakaraima Mts., 15 Oct. 1981, *Maas et al.* 5697 (K, NY). VENEZUELA. TERRITORIO FEDERAL AMAZONAS: Cerro Yacacana, 3 Jan. 1951, *Maguire et al.* 30720 (NY). BOLIVAR: Piar, Chimantá Massif, 26–29 Jan. 1983, *Huber & Steyermark* 6912 (MYF, VDB, VEN); 20 km E Canaima, 31 Aug. 1983, *Huber et al.* 8219 (MYF, NY, VDB); Apacará-tepui, 6–9 Feb. 1984, *Huber et al.* 8879; Guaiquinima Massif, 2 abr. 1984, *Huber* 9363 (MYF, NY, VDB); Sifontes, Río Soruape, 9 Sep. 1986, *Huber* 11837 (MYF, VDB); Ilu-tepui, 4 Apr. 1952, *Maguire* 33749 (NY); El Jardín, 22 June 1983, *N. Ramirez* 834 (PORT, UCV, VDB); campamento 150, km 150, NE Luepa, 24–25 abr. 1960, *Steyermark & Nilsson* 608 (NY).

This variety has much to distinguish it from the type, its tufts being shorter-stemmed and longer-leaved, its spikes larger and with (usually) more flowers and longer bracts with sepals proportionately shorter. Of particular interest but requiring larger samples for a more detailed study, are the staminodia, which may or may not be evident (and if present then unequal in length and position on the corolla), and the stylar appendages, which likewise vary considerably in shape and length as well as in number. It is probably best to treat this as a variety, at least until the characters of staminodia and stylar appendages are evaluated properly. It

now seems that in *Abolboda* these floral features are in transition.

2. *Abolboda killipii* Lasser, Bol. Soc. Venez. Ci. Nat. 9: 179. 1944. TYPE: Venezuela. Bolívar: muddy sabana, Río Torono, Alto Río Paragua, 20 ago. 1943, *F. Cardona* 832 (holotype, VEN; isotypes, F, NY, US). Figure 3.

A. psammophila Maguire, Bull. Torrey Bot. Club 75: 193. 1948. TYPE: Surinam. Grass savanna, Sanderij II, 3 June 1944, *Maguire & Stahel* 23667 (holotype, NY; isotypes, GH, U).

A. minima Maguire, Mem. New York Bot. Gard. 10: 7. 1963. TYPE: Venezuela. Territorio Federal Amazonas: Sabana Manacal, 15 km above Guarinumó, Río Atabapo, 125–140 m, 12 June 1959, *J. J. Wurdack & L. S. Adderley* 42977 (holotype, NY; isotypes, GH, NY, US).

Diminutive, rosulate annual or short-lived perennial, the foliage uniform or of one of two sorts, usually the early leaves stubby, 3–5 mm long, their bases clasping but constricted below the blade, this fleshy, either narrowly triangular with flat upper surfaces or slightly lingulate, or in cross section triquetrous to terete, the tips blunt to acute, mucronulate or subulate; longer leaves usually appearing later and just below flower, 3(–4) cm long, the bases thin, broadly clasping, to 3 mm wide, variously tapering to narrowly triangular or filiform-linear blades, these somewhat compressed and abaxially triple-ribbed or triquetrous, the midrib prominent, or triangular to terete, toward apex terete, the tips blunt, short-conic, subulate or subulate-aristate; leaf surfaces from smooth to quite granular-papillose or even scabridulous, occasionally rugulose-tuberculate, bright green, the papillosity best developed on the shorter leaves. Flowers 1–2 per inflorescence, the spikes usually with at least the base hidden by surrounding rosette leaves and only the spread corolla evident and exert, the bracteal leaves transitional to rosette leaves, spirally disposed around the spike base, lance-subulate, 5–9 mm long, the medial areas narrow, green, smooth or papillate, excurrent as outcurved, green, subulate, often aristate cusps, the border broad, pale, scarious; sepals 2, eccentrically lateral to ovary, lanciform, 4.5–8 mm long, somewhat inequilateral, navicular, firm, variously papillate, the apex variously subulate; corolla 10–13 mm long, pale blue or white, the lobes ca. as long as the narrowly campanulate tube; staminodia not evident; anthers bilocular, the ellipsoid thecae oblique (Fig. 3), ca. 1 mm long, pale, the slender filaments ca. 1.5 mm long; style open toward base, trique-

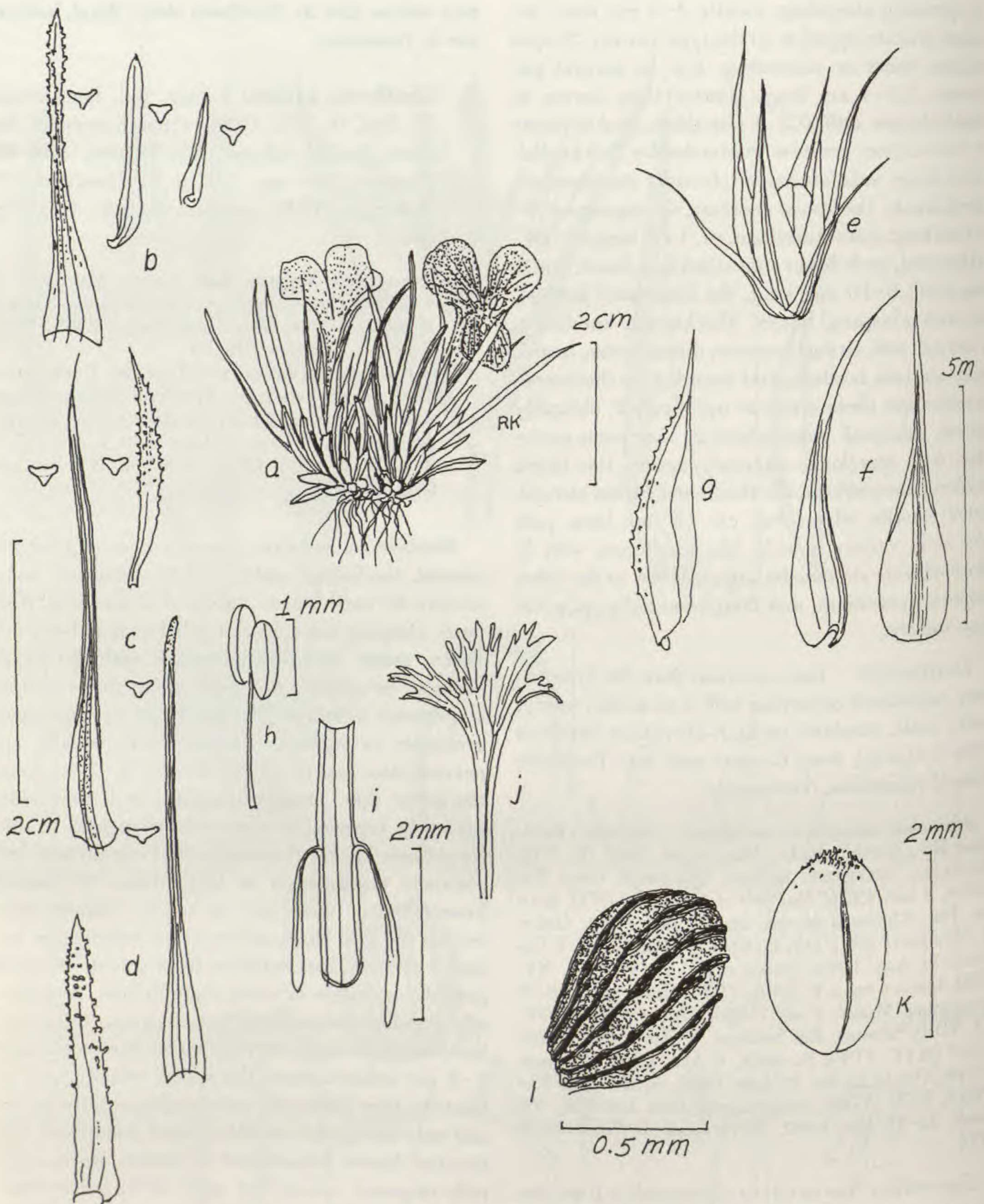


FIGURE 3. *Abolboda killipii* (Cardona 832).—a. Habit.—b.—d. A spread of “short” and “long” leaves, with accompanying cross sections, to show range.—e. Spike.—f. Fertile bract, side view (left), adaxial view (right).—g. Lateral sepal.—h. Stamen.—i. Stylar base.—j. Stylar apex.—k. Capsule.—l. Seed.

trous-alate, the appendages narrowly claviform, reflexed, ca. 1 mm long, only 2 evident (the laterals); style apex flaring to a funnellform, fibriate-bordered, 3-lobed tip. Capsule ellipsoid, ca. 2 mm long, the valves papillate at thickened, narrowly rounded tips. Seeds obovoid, ca. 0.7 mm long, deep red-brown or near black, with 5–6 strong, longitudinally spiral ribs per side.

Distribution. Infrequent in low-elevation sandy savanna (mostly under 500 m), Surinam west through Bolívar and Territorio Federal Amazonas in Venezuela and south in Amazonian Brazil.

Additional material examined. BRAZIL. AMAZONAS: Manaus-Caracarái Hwy., 17 Feb. 1974, W. C. Steward et al. P20345 (INPA, NY, U); Itapiranga, Rio Uatumã, 19 Aug. 1979, C. A. Cid et al. 526 (INPA, NY, VDB).

GUYANA. ATKINSON: St. Cuthbert's Trail, 26 Feb. 1969, *U. G. Bio. 106* (BRG, K, NY); Demarara: Kara Savanna, 21 Feb. 1910, *C. W. Anderson 510* (K, NY), 569 (K); Soesdijke, Sep. 1973, *A. Cooper 291* (U); trail to St. Cuthbert's, 8 June 1976, *Grewal & Persaud 201* (U). SURINAM. Gros-savanna (prope km 103), 8 Apr. 1959, *J. van Donselaar 730* (U); Zanderij I, 8 May 1959, *van Donselaar & T. B. Huinink D-C 12* (U); RR near km 62, 20 Apr. 1949, *Lanjouw & Lindeman 3009* (U); Zanderij savanna, 19 Sep. 1976, *Mori et al. 8339* (NY; note that this has scapes); Zanderij II, 6 Feb. 1942, *Stahel s.n.* (NY), 3 June 1944, *Maguire & Stahel 23667* (GH, NY, U; type of *A. psammophila* Maguire), 1 Mar. 1944, *Stahel s.n.* (K, U). VENEZUELA. TERRITORIO FEDERAL AMAZONAS: San Carlos, 30 Mar. 1978, *H. Clark 6574* (NY; some of this has scapes); Sabana Cucurital, 29 abr.-04 Mayo 1979, *Huber et al. 3674* (NY); E del cerro Yapacana, 28 June 1979, *Huber 3895* (NY); 4 km W Serranía Cuao, 14 July 1980, *Huber & Tillett 5300* (VEN, US); 2 km W San Antonio del Orinoco, 20 July 1980, *Huber & Tillett 5424* (US, VEN); San Carlos-Solano, 16 Sep. 1980, *Huber et al. 5679* (VEN); Serranía Vinilla, 13 June 1981, *Huber 6263* (NY); above Pimichin, 2 July 1959, *Wurdack & Adderley 43296* (NY). BOLIVAR: Trianna Savanna, Cerro Pitón, 4 Sep. 1962, *Maguire et al. 53593* (NY); 50 km SE El Dorado, 1 Sep. 1961, *Steyermark 89682* (NY, US); Sabana de Cusimi, Río Cusimi, 7 Mar. 1964, *Steyermark 93174* (NY).

This is indeed a "belly plant," and the great extremes of leaf length, flatness, and indumentum are, at least regarding the first two characters, perhaps a seasonal expression. Particularly conspicuous on most specimens are the rosettes exclusively of little, stubby leaves, these often developed severally on older stem bases and in strong contrast to the longer principal leaves in the same or different rosettes. While few collections are as yet available of this species, they grade in regard to nearly all features that are supposed to distinguish *Abolboda killipii* from *A. minima* Maguire. Two specimens (*S. Mori et al. 8339*, NY, and *Clark 6574*, NY) are of particular interest in that they have flowers ranging from sessile to produced on scapes 1.5–5 cm long. These specimens have the dimorphic leaves as in *A. killipii*, and the bract and sepal characters agree; some have granular foliage. These could show intergradation with *A. americana*.

3. ***Abolboda bella*** Maguire, Mem. New York Bot. Gard. 10: 15. 1958. TYPE: Venezuela. Territorio Federal Amazonas: Alto Río Orinoco, marshy areas, Yapacana Savanna III at 125 m, 17 Mar. 1953, *Maguire & Wurdack 34514* (holotype, NY; isotype, US). Figure 4.

Perennial, smooth herb from a horizontal stiff rhizome, the roots coarse, the leaves with bases

imbricate and secund along the rhizome, leaving a scaly residue of old sheaths, the principal leaves ascending to erect, firm, 9–17 cm long, the longer ones much overtopping scapes, with sheath ca. 10 mm across the clasping base, here stramineous to pale purple or brown, strongly multicostate and ecarinate, gradually narrowing into blade, the blades much longer than the sheaths, elongate-linear, compressed but firm, narrowing slightly above the middle then abruptly to a conic or subulate-spinose tip, the margins entire, forming a thickened, pale, cartilaginous border on the abaxial side, the surface pale to dark green, sometimes violet-tinted toward base, abaxially evidently ribbed, finely striate adaxially. Scapes erect and central, solitary, 5–10 cm long, terete, 1–1.2 mm thick, pale green, enfolded at base by short, erect, sheathing bracts 1–2 cm long and toward apex bearing a single pair of erect, unequal, lance-linear, involute scape bracts 3–20 mm below spike base, the outer one 1.3–1.5(–2) cm long, the inner one 2–2.5 cm long, these convex, green with pale scarious borders and subulate tips; spikes broadly, deliquescently turbinate or more narrowly turbinate (depending on stage), ca. 2 cm high from base to spreading sepal tips, the bracts much shorter than the sepals, the lowermost lance-ovate, ca. 13–14 mm long, cuspidate-subulate, the convex back green except for the pale costa and narrow, scarious, pale borders, the second bract ca. 12–13 mm long and similar but subtending the lowest floret, the third and fourth bracts slightly smaller still but similar in design and also subtending florets, the spike apex with 2–3 green, much smaller and narrower, sterile lanciform bracts; sepals 2 per floret, eccentrically lateral, lanciform-falciform, ca. 15 mm long, bent outward with broad, thin but firm, entire keels, narrowly acute, thick except for the thin margins; corolla salverform, the tube ca. 2 cm long, narrowly funnelform apically, the spreading lobes broadly elliptic, dark blue, ca. 12–15 mm long; filaments flattened, ca. 3 mm long, departing above median petal trace below the level of the corolla lobes; anthers lanciform-sagittate, ca. 3 mm long, dehiscence lateral-introrse; staminodes present as 3 filaments alternating with filament bases and set ca. 2–3 mm below them; style 23–24 mm long, the basal portion winged-triquetrous, each wing with a vein, this base geniculate ca. 5 mm above, here with traces departing into appendages, each appendage with a calloused "hook" or auricle distally and a downward-projecting spur ca. 2 mm long, the 3rd trace less distinct, into the 3rd wing and supplying a reduced narrower median appendage, this with a somewhat narrower "hook" and a filamentous spur much

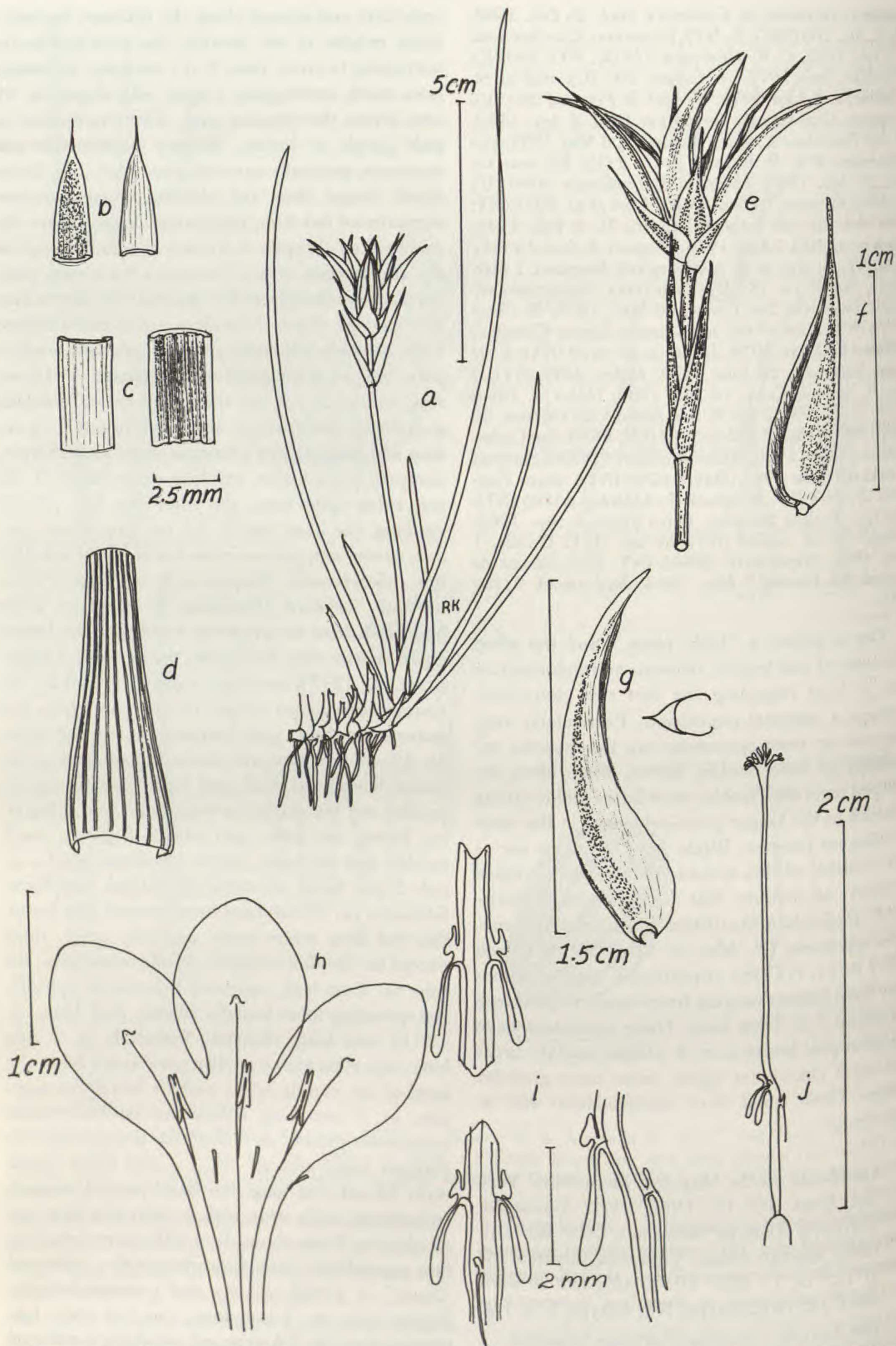


FIGURE 4. *Abolboda bella* (Maguire & Wurdack 34514).—a. Habit.—b. Leaf apex, adaxial side (left) and abaxial side (right).—c. Sector of leaf midblade, abaxial (left) and adaxial (right) views.—d. Leaf base (abaxial side).—e. Spike and upper scape.—f. Bract, oblique view.—g. Lateral sepal.—h. Spread corolla, stamens, and staminodia.—i. Three views of stylar base.—j. Style and stigma.

longer than the others (Fig. 4); style thence erect above the geniculation, becoming strongly involute and tubular just below the fimbriate-funnelform stigma apparatus. Capsule and seed not seen.

Distribution. Known only from the type, from the Yapacana savannas, at low elevations.

The rarity of this well-marked species is evidenced by the fact that, despite the frequency of visits by skilled field botanists, no further examples of the plant have been found since Maguire and Wurdack found it in 1953. In regard to its general habit, its almost distichously arranged leaves, and its floral features, this species shares many features with *Abolboda sprucei*, another rarity of the Orinoco savannas, and with *A. abbreviata*, still another rare one from Brazilian Amazonia.

4. ***Abolboda sprucei*** Malme, Ark. Bot. 25A(12): 17. 1933. TYPE: Venezuela. Territorio Federal Amazonas: Río Guainia, near mouth of Río Casiquiare, *R. Spruce 3456* (lectotype, K; isolectotypes, P, S; phototype at NY). Figure 5.

A. schultesii Idrobo & Lyman B. Smith, Caldasia 6(29): 246, fig. 31. 1954. TYPE: Colombia. Vaupés: Río Guainia, Puerto Colombia (opposite Venezuelan town of Maroa) and vic., ca. 800–850 ft., 31 Oct.–2 Nov. 1952, *R. E. Schultes, R. E. D. Baker & I. Cabrera 18177* (holotype, COL; isotypes, GH, US).

Solitary or caespitose, smooth, pale green perennial, the rosettes from a short, thick caudex, the roots coarse. Leaves elongate-linear to linear-lorate, 10–25 cm long, mostly erect to spreading-outcurved, the sheaths pale or distally purple, broadly clasping and convex at base, thence contracted and lingulate, gradually broadened to the elongate, compressed, flattened or conduplicate folded blades, these 4–10 mm wide with acute to acuminate, somewhat thickened tips, the margins thin and entire, the adaxial surface finely indented-nerved, the abaxial surface strongly raised-nerved, the median nerve forming a strong and elevated costa. Scapes 1–several per rosette, erect or outcurved, 15–30 cm long, strongly unisulcate, thus in cross section forming a “U” or “V,” 2–3 mm thick, the bracts confined to the distal part, leafy, lance-linear, 4–7 cm long, subequal, 1–2 or more pairs, the lowest pair sometimes as much as 3 cm below the spike or spikes; inflorescence a single spike or a cluster of a few spikes, the spikes ca. 2 cm long; all spike bracts subtending flower, 9–12 mm long, shorter than the sepals subtended, ovate, acuminate to strongly cuspidate, very firm, the backs frequently carinate toward apex; sepals 2, lanciform, 12–13 mm long, rigid and strongly curved, acute, the margins chartaceous, the dorsal

area thickened, with a broad, chartaceous, alate keel; corolla from base to petal tip 22–24 mm long, pale blue, the broadly ovate lobes ca. 12 mm long; stamens with anthers oblong-linear, deeply emarginate and sagittate, ca. 2 mm long on filaments ca. 1.5 mm long; staminodia when present linear, peglike; ovary ca. 3 mm long, ellipsoid, 1 carpel bilobed at apex, this confluent with the style base, the other carpel tips rounded; style including stigma 6 mm long, the appendages midway up, 3, the laterals compressed-clavate, ca. 1.5 mm long, the median one reduced to a filament; stigma funnelform, of 3 connivent but excurved fimbriate lobes. Capsule oblong-cylindric, very thickened, 5 mm long. Seed nearly round to obovoid-prismatic, dull brown, the outer coat finely and irregularly ribbed longitudinally, the ribs anastomosing to produce an irregularly and narrowly alveolate pattern, the body 1–1.2 mm long.

Distribution. Frequent in low-to-medium-elevation sandy savanna, southwestern Venezuela (Territorio Federal Amazonas), and contiguous southeastern Colombia (Vaupés).

Additional material examined. VENEZUELA. TERRITORIO FEDERAL AMAZONAS: 1 km E of Maroa, 16 Apr. 1953, *Maguire & Wurdack 35688* (GH, NY, US), *Maguire et al. 36419* (F, K, NY, U); 0.5 km E of Maroa, 6 Oct. 1957, *Maguire et al. 41721* (K, NY, US); 1 km W La Cieba, 4 Oct. 1957, *Maguire et al. 41919* (NY, US).

The most unusual feature of this species is the size and disposition of the scape bract pairs, which form what appears to be a leafy involucre, this sometimes with the 1(–2) spikes sessile above it or removed by a short but distinctive internode.

5. ***Abolboda ebracteata*** Maguire & Wurdack, Mem. New York Bot. Gard. 10: 17–18. 1958. TYPE: Venezuela. Territorio Federal Amazonas: Yapacana Savanna III at 125 m, 31 Dec. 1950, *Maguire, Cowan & Wurdack 30469* (holotype, NY; isotype, US).

- 5a. ***Abolboda ebracteata*** var. ***ebracteata***. Figure 6.

Caespitose, stiff, smooth perennial, the stems short, cloaked in chaffy old leaf bases, the roots coarsely fibrous. Leaves usually of two sorts, those of new shoots short-linear, rarely longer than 2 cm, grading into main rosette leaves, these ascending to spreading, mostly outcurved, 5–12(–15) cm long, the thin bases broadly dilated, multinerved, pale, to 5 mm broad, with scarious entire borders, narrowing rather abruptly to elongate-linear, green blades, tapering gradually from ca. 1.5 mm broad to 0.5–0.7 mm broad, at apex blunt,

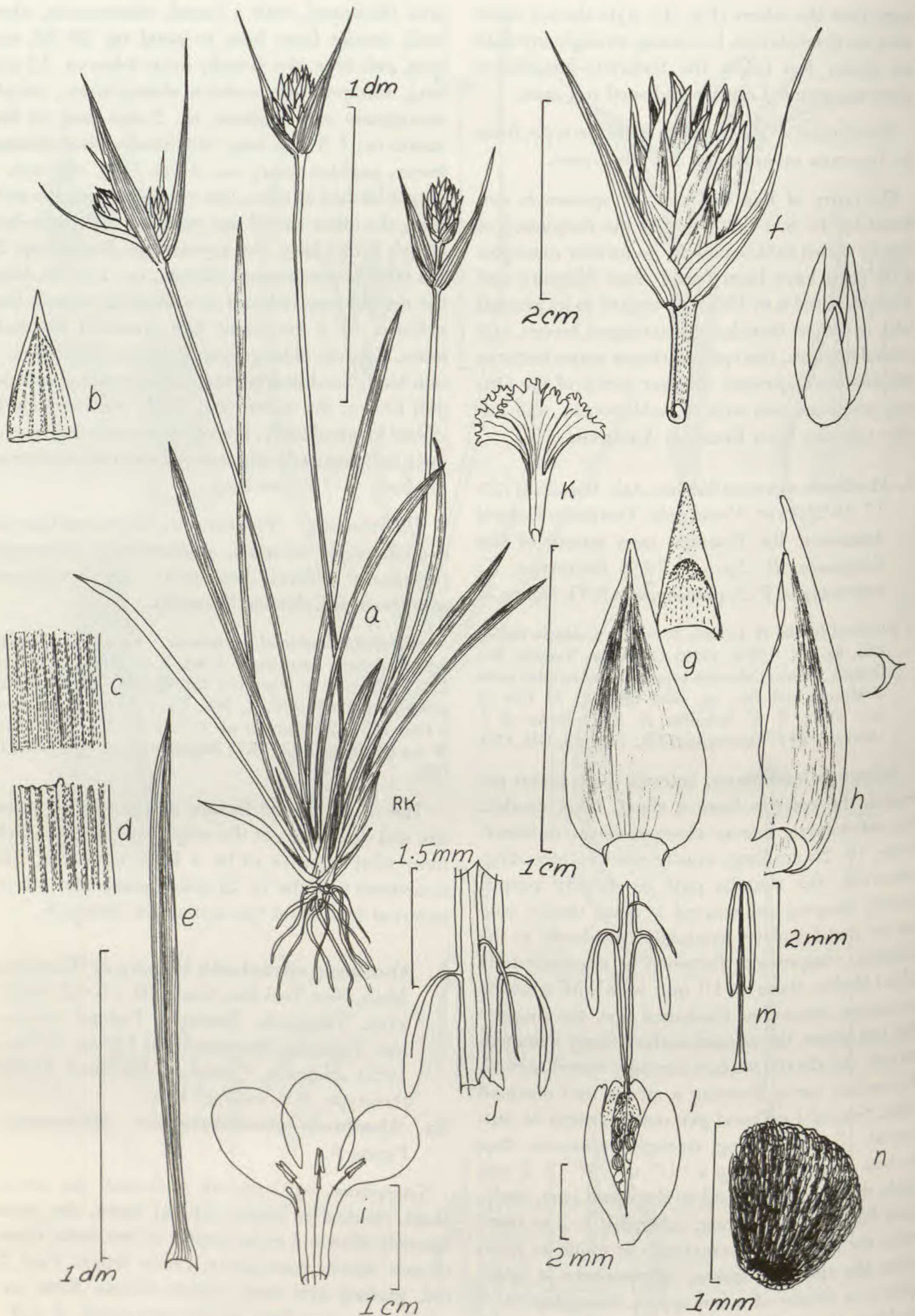


FIGURE 5. *Abolboda sprucei* (composite of collections from vic. Maroa, Territorio Federal Amazonas, Venezuela).—a. Habit.—b. Leaf tip.—c. A section from midblade, adaxial surface.—d. A section from midblade, abaxial surface.—e. Entire leaf.—f. Spike (left); sepal pair subtended by fertile bract (right).—g. Fertile bract and (slightly above, right) inside view of its tip.—h. Lateral sepal.—i. Spread corolla, outline, with stamens and a staminodium to scale.—j. Styler base.—k. Styler apex.—l. Ovary and style base.—m. Stamen.—n. Seed.

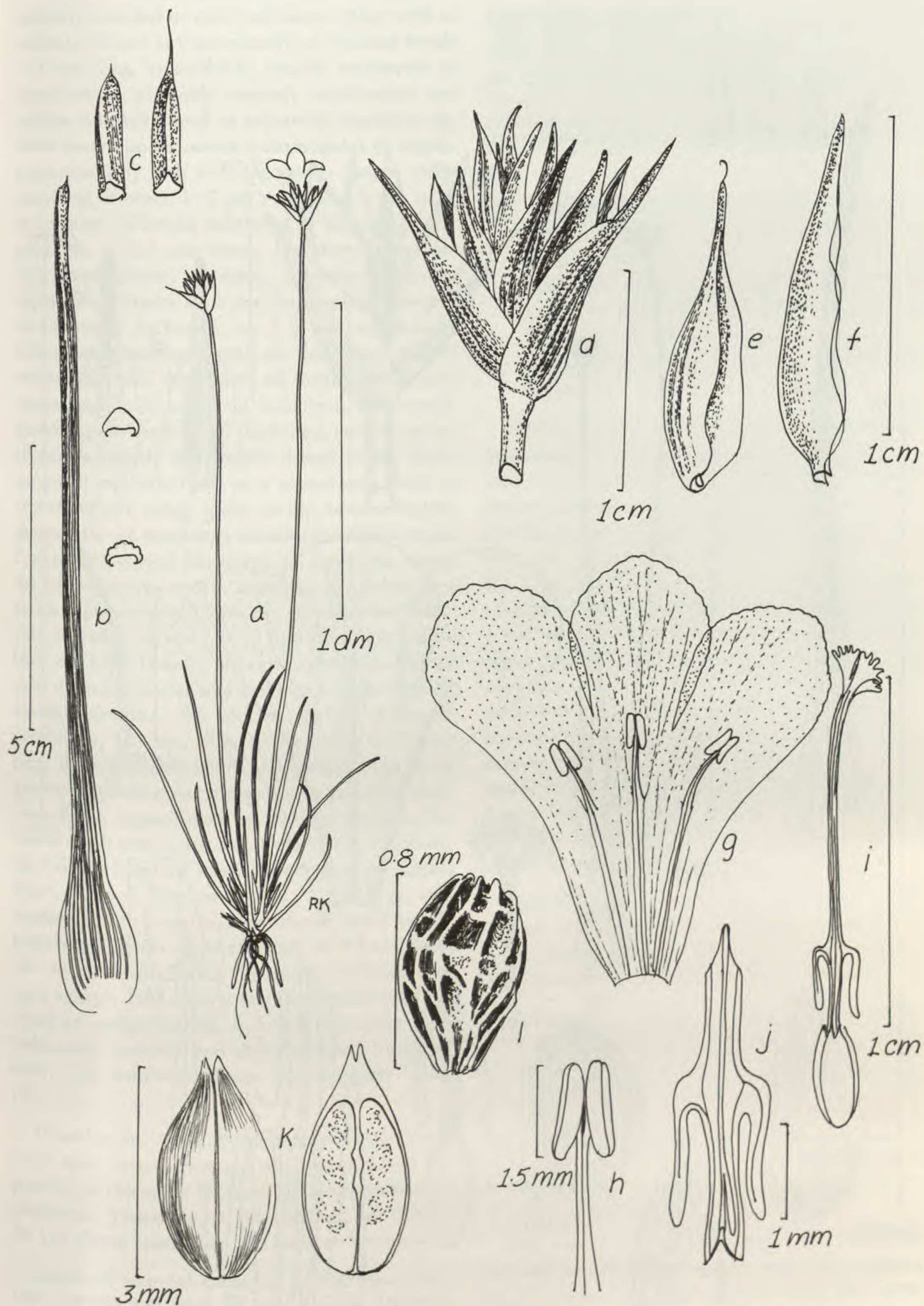


FIGURE 6. *Abolboda ebracteata* var. *ebracteata* (Maguire, Cowan & Wurdack 30469, Steyermark & Bunting 103242).—a. Habit.—b. Leaf, adaxial view, with appropriate cross sections.—c. Two common sorts of leaf tip (idealized).—d. Spike.—e. Inner fertile bract.—f. Associated lateral sepal.—g. Spread corolla, stamens.—h. Stamen.—i. Gynoecium.—j. Style base showing appendages.—k. Capsule, external view (left); valve, inner view (right).—l. Seed.

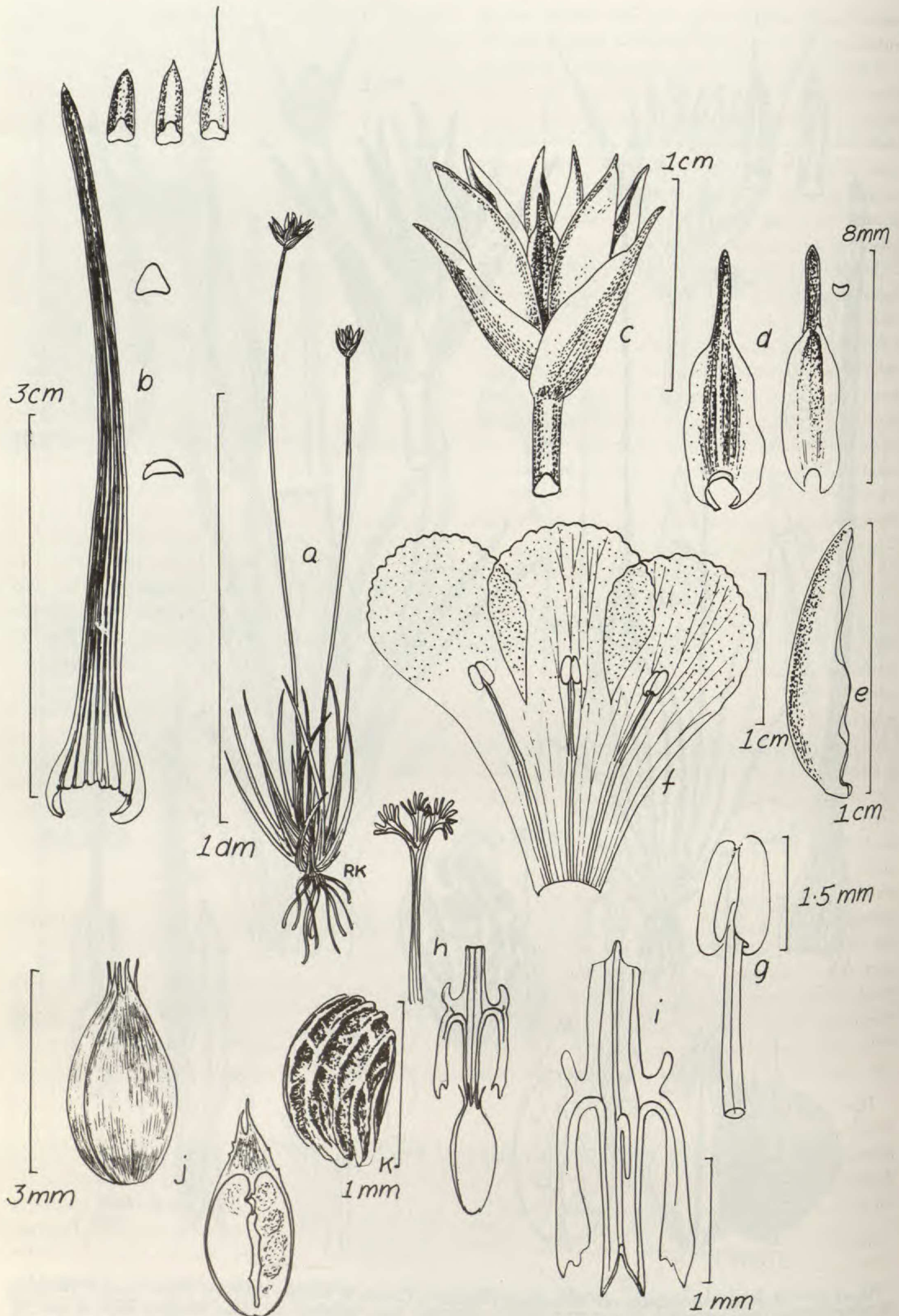


FIGURE 7. *Abolboda ebracteata* var. *brevifolia* (Wurdack & Adderley 43689; Huber & Tillett 2813).—a. Habit.—b. Principal leaf (left); 3 common types of tip (above).—c. Spike.—d. Inner fertile bract, abaxial view (left);

narrowly rounded or conic-subulate, either with or without a mucro or (occasionally) a terminal bristle 1–3 mm long, at midblade usually semiterete or plano-convex, abaxially coarsely multicostate and convex, adaxially level or somewhat concave, up-blade toward tip becoming subtriangular or triquetrous, abaxially with a strong costa. Scapes stiffly ascending or erect, 1–2 per rosette, 1–2 dm long, at some or all levels subterete to obtusely triangular, ca. 1–1.2 mm thick, bractless except for 2–3 conduplicate, scarious, subulate-setaceous-tipped basal bracts to 2 cm long; spikes post-anthesis broadly turbinate, ca. 1.5 cm long, mostly 4-flowered (sometimes with an additional pair of reduced florets), the bracts all fertile, the 2 outermost ones to 15 mm long, lanciform, with broad, scarious, pale borders and thickened, convex, green or purple-tinged, low-costate dorsal areas, these narrowed and excurrent as a prominent, blunt to aristate-tipped cusp; inner fertile bracts slightly shorter (10–11 mm long), broader in outline; sepals 2, navicular, curved-lanciform, ca. 1 cm long, acute, the keels narrow, entire, and firm, bordered by a green or purple-tinted zone, the outer border broad, pale, scarious; corolla 12–13 mm long, bright dark blue, the lobes broadly obovate, crenulate, shorter than the tube; staminodia lacking; anthers broadly oblong, bilocular, the locules slightly divergent proximally, 1.5 mm long, on filaments ca. 2 mm long, these attached below the corolla sinus level; gynoecium with stylar apparatus proximally alate-triquetrous, appendaged ca. ¼ way up from the ovary, the lateral appendages claviform, recurved, ca. 1.5 mm long, the medial appendage set slightly lower, reflexed, filamentous, ca. 1 mm long; stigmatic part with 3 spathulately dilated lobes, distally fimbriate. Capsule ovoid-ellipsoid, 3–3.5 mm long, the valves distally much thickened, acuminate, at apex sharply bifid. Seeds few, asymmetrically obovoid or wedge-shaped, 0.7–0.8 mm long, dark red-brown, coarsely and sharply ribbed longitudinally, with somewhat lower and irregular cross-ribs.

Distribution. Locally abundant in moist to wet white sand savanna around the base of Cerro Yapacana, on the upper Orinoco in Territorio Federal Amazonas, Venezuela, at 100–125 m, one locality 30 km above confluence of Orinoco–Ventuari.

Additional material examined. VENEZUELA. TERRITORIO FEDERAL AMAZONAS: W base of Cerro Yapacana,

Savanna III, 6 May 1979, *Davidse et al.* 17246 (MO, VDB), *Huber* 1626 (US), *Huber* 2037 (K, MYF, NY, VDB); 30 km SE of confluence Orinoco–Ventuari, 30 nov.–1 dic. 1978, *Huber* 2183 (MYF, VDB); Yapacana Savanna 3, 17 Mar. 1953, *Maguire & Wurdack* 34516 (paratype, NY); Cerro Yapacana, savanna, 7 mayo 1970, *Steyermark & Bunting* 103242 (NY, VEN).

5b. *Abolboda ebracteata* var. *brevifolia* Maguire, Mem. New York Bot. Gard. 10: 8. 1963. TYPE: Venezuela. Territorio Federal Amazonas: righthand bank of Río Orinoco, 10 km above mouth of Río Ventuari, 125 m, 21 July 1959, *Wurdack & Adderley* 43689 (holotype, NY; isotypes, GH, NY, US, VDB). Figure 7.

Similar to the type but leaves ranging shorter and tending to be more dimorphic, the innovations with several series of short, stubby-bladed, sharply triquetrous and curved, linear-subulate leaves, later grading to more elongate ones, these (2–)3–10 cm long, strongly curved, with character much as in the type variety but with blade tips more often spinulose. Spikes ranging shorter, mostly not over 1 cm long, the bracts thus shorter, with shorter cusps; lateral sepals 9–10 mm long; corolla and stamens as in the type variety; gynoecium with somewhat more elaborate stylar appendages, recurved as in the species but each producing a narrow, erect but curved auricle at base (on the upside of appendage). Capsule likewise ovoid, ca. 3 mm long, the valves similarly bifid, the teeth narrower, sharper. Seeds as in the species but slightly longer (to 1 mm).

Distribution. Moist to wet savanna, at 100–150 m, along the Orinoco and near confluence of major streams with it, Territorio Federal Amazonas, Venezuela, and in Amazonas, Colombia.

Additional material examined. COLOMBIA. AMAZONAS: Alto Río Orinoco, Cacagual Savanna, 13 Sep. 1957, *Maguire et al.* 41439 (NY). VENEZUELA. TERRITORIO FEDERAL AMAZONAS: vic. Canaripó, Río Ventuari, 29 May 1978, *Huber* 1875 (US); 30 km SE confluence of Orinoco–Ventuari, 30 nov.–1 dic. 1978, *Huber & Tillett* 2781 (NY, US), 2813 (K, NY); 30 km W Serranía El Tigre, 29 Feb. 1980, *Huber* 4848 (NY); 30 km N Puerto Ayacucho, 19 May 1980, *Huber* 5216 (NY—a mix with *A. pulchella*).

This variety is a little weak. The character stressed by Maguire, namely, that the cephalar bracts (outer ones) are shorter than the inner,

appears to vary more widely, as do leaf lengths, and this variation does not appear to be as little as was first observed.

6. *Abolboda americana* (Aublet) Lanjouw, *Recueil Trav. Bot. Neerl.* 34: 492. 1937. *Xyris americana* Aublet, *Hist. Pl. Guiane* 1: 140, 3: pl. 14. 1775. TYPE: French Guiana, *Aublet s.n.* (lectotype, P; isoelectotype, BM; phototype, NY). Figure 8.

Xyris caerulea Lam., *Tabl. Encycl.* 1: 136, t. 36, fig. 2, as "*X. bleue*." 1791.

Abolboda imberbis Kunth in HBK, *Nov. Gen. Sp.* 1: 256. 1816. *A. americana* Aublet var. *imberbis* (Kunth in HBK) Maguire, *Bull. Torrey Bot. Club* 75: 193. 1948. TYPE: "crescit in arenosis guayanae ad flumen Atabapo" (international boundary between Colombia and Venezuela). Ostensibly collected by Humboldt.

A. poeppigii Kunth, *Enum. Pl.* 4: 27. 1843. TYPE: Campina Grande de Colares (Pará), June 1832, *Poeppig 2993* (holotype not formally designated, specimens at B, F, M, P; phototype, NY).

Soft, glabrous, solitary or caespitose annual or short-lived perennial, the stems leaf-cloaked, mostly short, rarely to 2.5 cm long, the roots spongy-thickened. Leaves typically of 2 lengths, those of secondary rosettes (which arise on buds around scapes on primary rosettes) stubby, short-linear, 3–10 mm long, abruptly narrowed from clasping thin bases, fleshy-linear, acute, mostly trigonous or triquetrous, upstem later in season grading longer, distinctly narrower, mostly spreading, or ascending with incurved tips, 15–120 mm long, narrowing from (mostly) triplinerved soft pale bases to elongate-linear, flattened blades, these for most of their length 0.3–0.7 mm wide, dorsiventrally compressed, triplinerved, the adaxial face usually plane, the abaxial face showing thickened margins and a distinct costa, pale to deep green, or tinged with maroon or red, toward apex variously thickened, blunt and with an eccentric short mucro at tip. Scapes rarely shorter than leaves, usually equal to them or much longer, usually wrapped at base in 2–3 scarious, ovate-lanceiform, mucronate or cuspidate basal bracts, otherwise bractless, 2.5–15 cm long, terete, sometimes low-fluted or striate; spikes by seeding time broadly turbinate to hemispheric, 5–6(–7) mm high, 2–3(–4)-flowered, typically with 2 lance-ovate, cuspidate or mucronate, keeled sterile bracts 2.7–6 mm long at base, the lowest one usually 1–2 mm shorter than the other or all bracts fertile, 5–6 mm long, ovate-lanceolate, strongly keeled, broadly scarious-bordered, the median area thickened and with a strong green to maroon costa, this mostly much excurrent as an

outcurved cusp; sepals 2 or sometimes accompanied by a reduced inner one, this mostly oblanceolate, ca. 3 mm long, scarious, broadly acute to rounded at apex, the 2 lateral sepals navicular-conduplicate, oblong-obovate, 5–5.5 mm long, shallowly emarginate, pale-scarious except for the strong, short-excurrent, entire keel; corolla mostly 13–15 mm long, the lobes oblong-ovate, narrowly rounded at tip, light blue; staminodia not evident; anthers bilocular, pale, the thecae divergent at base, the flattened filaments 1.2–1.3 mm long; style ca. 10 mm long, triquetrous at base and with 2 recurved-clavate, lateral appendages 1–1.5 mm long, and a reduced, short-filamentous adaxial one. Capsule broadly ovoid, 2.5–3.5 mm long, smooth, the valves thickened, especially distally at the incurved, entire, smooth, acute tips. Seeds broadly obovoid to inequilaterally subglobose, ca. 0.5 mm long, coarsely 9–11-ribbed, the broad ribs be-decked with deep red-brown papillae and often somewhat rugulose, the intervals paler and irregularly transversely rugulose.

Distribution. Frequent, mostly in low-elevation, wet, sandy substrates of savanna, caatinga, restinga, and broad, wet, open grass-sedge campo, often in recently disturbed, wet, burned areas, South America from French Guiana west to southeastern Colombia, south into Amazonian and northeast-coastal Brazil (Amapá, Amazonas, Bahia, Paraíba, Pará).

Additional representatives examined. Because of large amount of material seen, only selected specimens are cited here to demonstrate geographical and morphological range): BRAZIL. ACRE: Cruzeiro do Sul, Ponto 10, 10 Feb. 1976, *Rosa 696* (US, VDB). AMAPA: Campo de Aviacas, 25 Apr. 1960, *Egler 1417* (US); between Rios Cujubim and Flechal, 8 Aug. 1962, *Pires & Cavalcante 52000* (U). AMAZONAS: Bella Vista, 15–18 Mar. 1944, *Baldwin 3558* (F, K, US). BAHIA: 5 km SE Marau, 2 Feb. 1977, *Harley 18462* (K, NY, VDB), *18463* (NY, VDB); Alcobaça, *Mori et al. 10614* (K, NY). PARA: Maracana, 6 Dec. 1978, *Bastos et al. 106* (F, NY); Vigia, 24 Jan. 1950, *Black, herb. no. 50.8817* (US); 36 km SE Vigia, 29 Mar. 1980, *Davidse et al. 17539* (F, GH, US, VDB); Marudá, 3–4 Apr. 1980, *Davidse et al. 17856* (F, MO, NY, VDB); Collares, 16 Aug. 1913, *Ducke 12576* (U, US). PARAIBA: Paraíba, *Moraes 2A38* (NY, US). RORAIMA: Carecarai, 7 Feb. 1974, *Pires & Leite 14855-14861* (US). COLOMBIA. GUAINIA: Puerto Inirida, 14 ago. 1975, *Garcia-Barriga 20.823* (US), *20.824* (F); San Filipe, 6 Apr. 1984, *Gentry & Stein 46389* (MO, VDB). VAUPES: Araracuara, 5 Sep. 1959, *Maguire & Fernandez 44125* (NY). GUYANA. Wanama River, 10–23 May 1923, *J. S. de la Cruz 4378* (NY); Kaieteur Plateau, 30 Apr. 1944, *Maguire & Fanshawe 23116* (GH, NY, U, US), 3 May 1944, *Maguire & Fanshawe 23178* (F, GH, K, MO, U, US), *23188* (F, GH, K, MO, NY, U, US); Partang Savanna, 13 June 1960, *Maguire & Tillett 43815* (K, NY, U). SURINAM.

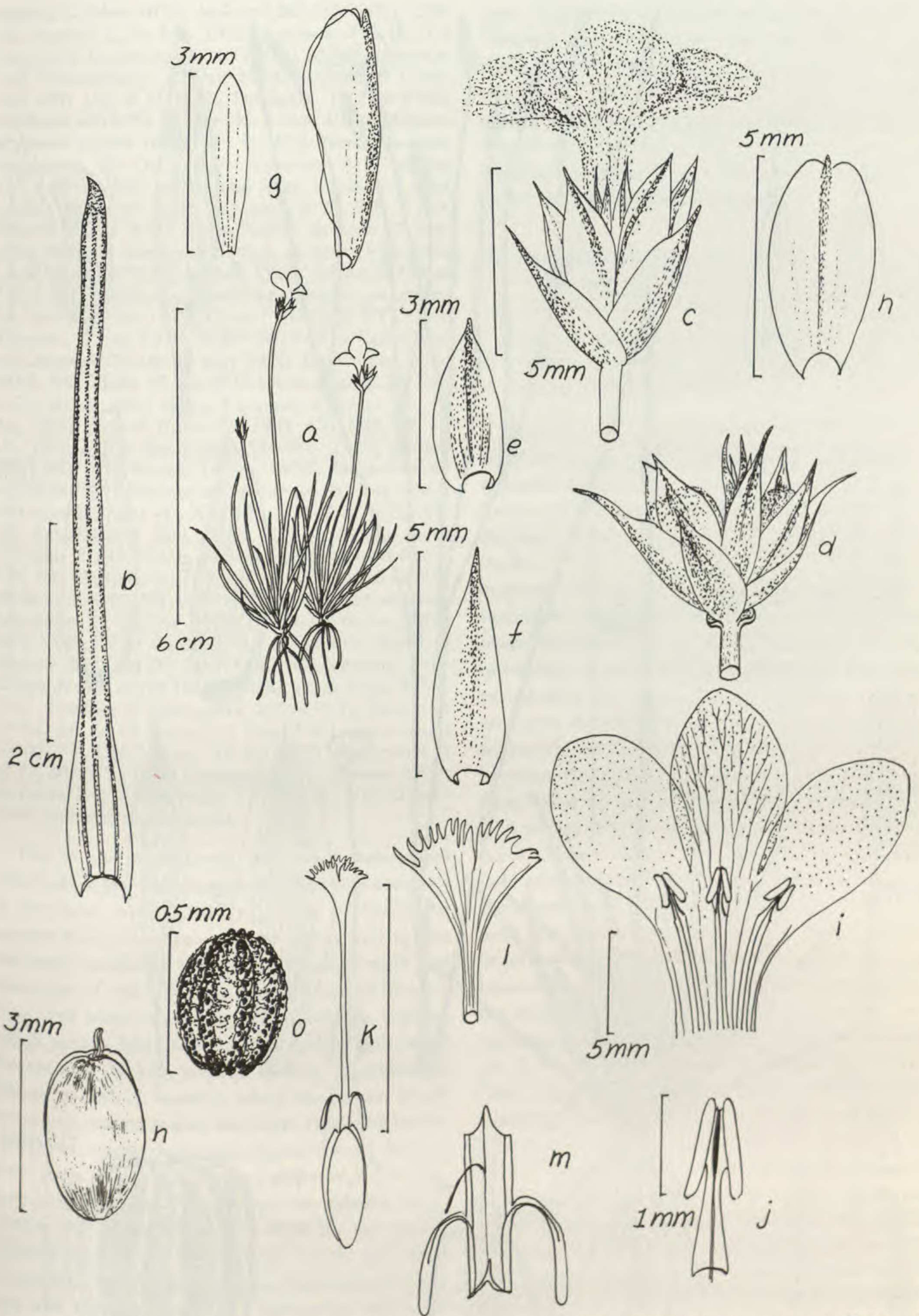


FIGURE 8. *Abolboda americana* (Huber & Alarcon 8002; Wurdack & Adderley 43757).—a. Habit.—b. Principal leaf.—c. Flowering spike.—d. Fruiting spike.—e. Lower sterile bract.—f. Fertile bract.—g. Inner sepal (at left), side view of lateral sepal (at right).—h. Spread lateral sepal, outer side.—i. Spread corolla and stamens.—j. Stamen.—k. Gynoecium.—l. Stigmatic apparatus.—m. Styler base with appendages.—n. Capsule.—o. Seed.

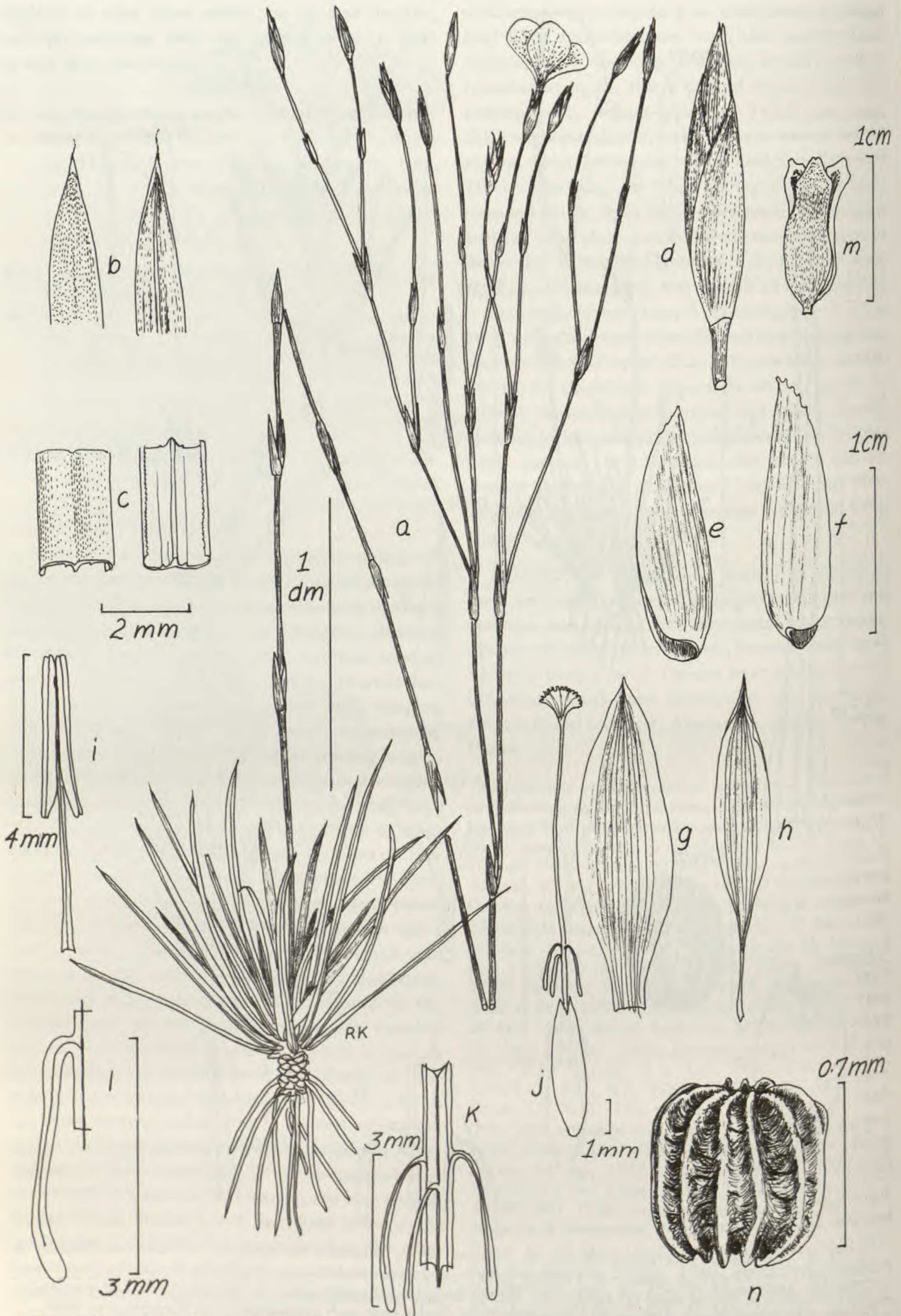


FIGURE 9. *Abolboda paniculata* (Cowan & Wurdack 31387; Tavares & Silva 31).—a. Habit.—b. Leaf tip, upper surface (left), lower surface (right).—c. Sector of leaf midblade, adaxial side (left) and abaxial side (right).—

Zanderij, 22 Mar. 1976, *Jansma LBB 15685* (U), 3284 (U); Zanderij I, 29 July 1933, *Lanjouw 294* (K, U); *Lanjouw & Lindeman 108* (NY, US); Morengo tapoe to grote Zwiebelzwamp, 22 Oct. 1948, *Lanjouw & Lindeman 1007* (U); E of Kopie Penninica, 16 July 1953, *Lindeman 4378* (F); Zanderij II, 3 June 1944, *Maguire & Stahel 23666* (GH, NY, U, US); Natioureservaat Brinkheuvel, 20 Oct. 1967, *Teunissen & Wildschut 11870* (U—a little plant, long spike bracts and short scapes). TRINIDAD. Aripo Savanna, 9–23 Feb. 1950, *Howard 10515* (GH); Long Stretch Savanna, 2 Apr. 1953, *Baker & Simmonds 14931*, 26 Aug. 1977, *Philcox & Maas 8228* (K), 13 July 1976, *Adams & Kalloo 14013* (K). VENEZUELA. TERRITORIO FEDERAL AMAZONAS: San Carlos, 3 June 1979, *Clark 7188* (MO, NY); Cerro Yapacana, 3 June 1978, *Huber 2018* (NY); Caño Caname, Cucurital, 29 Apr.–5 May 1979, *Huber et al. 3694* (MYF, NY, VDB); 15 km SSW Cerro Autana, 26 June 1979, *Huber 3821* (NY); Yapacana Savanna III, 10 Aug. 1983, *Kral & Huber 70712* (F, GH, MO, NY, U, US, VEN, VDB); San Carlos, 26 Nov. 1977, *Liesner 3910* (MO, NY); Maroa, 16 Sep. 1957, *Maguire et al. 42503* (NY, U, US); base of Cerro Duida, 22 Aug. 1944; *Steyermark 57831* (F, NY, US), *57847* (F, GH, NY, US); Esmeralda, 1 Nov. 1928, *Tate 299* (NY); above Pimichin, 2 July 1959, *Wurdack & Adderley 43297* (GH, NY, U); Caño Cumaré, 5 Aug. 1959, *Wurdack & Adderley 43757* (NY, US), *43767* (NY, US). BOLIVAR: Salto Aicha, 27–28 Nov. 1982, *Davidse & Huber 22898* (MO, VDB); W of Canaima, 25 ago. 1983, *Huber & Alarcon 8002* (MYF, NY, VDB); Guaiquinima, Salto Carapo, *Huber 12426* (MYF, VDB); Cerro Pitón, 4 Sep. 1962, *Maguire & Steyermark 53594* (NY); Sabana de Triana, SE de El Dorado, 1 Sep. 1961, *Steyermark 89681* (NY, US); Icabaru, 18 dic. 1978, *Steyermark et al. 117802* (NY); Cerro Guaiquinima, 20–25 enero 1977, *Steyermark & Dunsterville 113137* (K, NY—a very small plant with short scapes).

This is the commonest and most widespread *Abolboda* in low-elevation sites (much less common in elevations over 1,000 m). It is probably the nearest thing to a weed in the genus and is also the most variable in leaf, scape length, length and character of spike bracts, and number of flowers. It is most often confused with *Abolboda killipii*, which usually has nearly sessile spikes with fewer flowers and thicker, usually shorter, scabridulous foliage, or with *A. acaulis*, which has larger, sessile or stouter-scaped spikes and more rigid and linear-triangular, mostly setaceous-tipped leaves. Both of these latter species have a very different seed sculpture (see figures). While I have no trouble interpreting the Aublet material as type for the species (identification of the two elements on the type sheet is possible from the phototype), there is some problem with the synonymy, as I have seen only para-

type material of the Poeppig collections ("Para, *Poeppig s.n.*, L"). However, the phototype of *Poeppig D. 2993* taken at Geneva is still legible enough to make an identification. Essentially this material represents a lower, shorter leaved-and-scaped extreme that grades through other transitional specimens to taller forms and does not appear to me to be varietyally distinct.

7. ***Abolboda paniculata*** Maguire, Mem. New York Bot. Gard. 10: 10, fig. 2a–g. 1958. TYPE: Venezuela. Territorio Federal Amazonas: cumbre at 2,000 m, Cerro Parú, 10 Feb. 1951, *R. Cowan & J. Wurdack 31387* (holotype, NY; isotypes, US, VEN). Figure 9.

Smooth, rosulate, perennial herb, the stem short, stout (to 1 cm thick), caudiciform or attached to a stouter horizontal or ascending, knobby rhizome. Leaves of rosette monomorphic, spreading or ascending, usually outcurved, 5–15(–17) cm long, the bases thin, scarious, pale, convex and strongly costate, constricted to a narrow "U"-shaped attachment with blade and dilating just above the blade, this linear-triangular, rigid, stiff and thin but not fleshy, tapering to a narrowly acute, acuminate, or subulate tip, sometimes prolonged variably to an arista, the margins thin, pale, narrowly revolute, frequently papillate, the adaxial surface dark green, lustrous, the midnerve depressed, the abaxial surface with a strong, elevated median costa and often 2–4 strong laterals convergent apically to a single costa. Scape solitary, 5–12 dm high (including inflorescence), terete and multistriate, usually purple-brown, to 5 mm thick at base, tapering gradually into a (usually) "V"-shaped, dichotomously branched panicle, the scape bract pairs numerous, lance-oblong or lance-triangular, likewise purple-brown, subequal, the proximal pairs longest, to 2 cm long, gradually reduced upward, the upper ones ca. 1 cm long, with a pair at each inflorescence fork and a pair usually median on the ultimate flowering branches; spikes colored as in bracts, terminal on branches, fusiform, ca. 2.5 cm long, terete; fertile bracts 2, ovate-lanceiform, involute and with rounded backs as in scape bracts, the lower one ca. 1.5 cm long, the inner one slightly longer, ca. 1.7 cm, both with narrow scarious borders, and erose or lacerate, narrowly acute or acuminate tips; sepals 3, 2–2.2 cm long, the lateral

d. Spike.—e. Sterile spike bract.—f. Fertile bract.—g. Lateral sepal.—h. Inner sepal.—i. Stamen.—j. Gynoecium.—k. Styler base and appendages.—l. Lateral styler appendage, enlarged.—m. Open capsule.—n. Seed.

ones lanciform, clasping at a narrow base, the inner sepal strongly clawed, the blade elliptic, thinner than in the lateral ones, the margins somewhat involute distally, the apex acuminate; corolla bright lavender-blue or blue-violet, ca. 4 cm long, the spreading lobes broadly ovate, ca. 2 cm long; anthers linear, 4 mm long, deeply sagittate, emarginate, on narrow, flattened filaments to 3 mm long; ovary ellipsoid, ca. 5 mm long, its tip tridentate, the style ca. 2 cm long, with 3 recurved, subequal, narrowly clavate, terete appendages to 3 mm long toward its base; stigma broadly funnelform, the receptive border glandular-erose. Capsule oblong-ellipsoid, ca. 1 cm long, the 3 valves woody, particularly thickened distally. Seeds broadly obovoid to subglobose, ca. 0.7 mm long, a glistening dark brown or nearly black, with ca. 6 spiral ribs per side, these strongly and irregularly raised, sometimes forming narrow wings and interconnected by narrow, less-raised irregular cross-lines.

Distribution. Frequent but local in acidic, sandy-peaty, open or shrubby bog savanna, tepui summits and surrounding plateaus, at 1,150–2,100 m, from southern Bolívar and Territorio Federal Amazonas, Venezuela, southward just inside the border of contiguous Amazonas, Brazil.

Additional material examined. BRAZIL. AMAZONAS: arredores de serra Aracá, 29 Jan. 1978, *Rosa & Lira* 2297 (F, NY); SE parte de Serra Norte, plato da Serra Aracá, 14 Feb. 1984, *Tavares & Silva* 31 (INPA, NY, VDB); plateau savanna, N massif of Serra Aracá, 11 Feb. 1984, *Prance et al.* 28987 (NY, VDB). VENEZUELA. TERRITORIO FEDERAL AMAZONAS: Serranía Parú, 2,000 m, cumbre along W rim, 1 Feb. 1951, *Cowan & Wurdack* 31300 (paratype, NY). BOLIVAR: Meseta de Jaua, Cerro Jaua, cumbre, 1,922–2,100 m, 22–27 Mar. 1967, *Steyermark et al.* 109328 (F, K, NY).

On the basis of most characters, particularly the number and arrangement of spike bracts and sepals, the highly anthocyanic pigmentation, and its general large size and color of corolla, this species is closely allied to *Abolboda uniflora* and *A. neblinae*. However, it is a much more coarse species, unique in its much-branched inflorescence. Unlike *A. neblinae* (presumably also *A. uniflora*), this species has well-developed stylar appendages.

8. *Abolboda neblinae* Maguire, Mem. New York Bot. Gard. 17: 80. 1967. TYPE: Venezuela. Territorio Federal Amazonas: common in boggy area in open places, *Bonnetia* woodland, at 2,400 m, Venezuelan side of Brazilian Divide, 2 km E Boundary Marker no. 4, Cerro de la Neblina, 1 Nov. 1965, *B. Maguire, J. M. Pires & N. T. Silva* 60523 (holotype, NY; isotypes, NY, UB, US). Figure 10.

Glabrous rosulate perennial, the rosettes in dense domelike mats, the roots coarse, the stems short. Leaves mostly curved, spreading to spreading-out-curved, linear-triangular, stiff, 3–7 cm long, narrowing from thin, strongly costate, convex pale bases into flattened, linear blades, these thickening toward apex and at tip narrowly acute and usually prominently spinulose, the margins very thin, the upper surface proximally with a shallow median groove, otherwise nearly smooth, the abaxial surface more prominently ribbed, the median nerve a strong costa. Scapes 1 per rosette, 20–40 cm long, distally 1.5–2 mm thick, terete, striate longitudinally, these and the bracts maroon or purple-brown; scape bracts appressed, in 2–3 well-spaced pairs, members of a pair subequal, lance-oblong or oblong-elliptic, 1.5–2 cm long, apically acute to acuminate-subulate with narrow, pale scarious borders; spikes 1(–2, sometimes an additional spike from next bract axil down), terminal, fusiform or lanciform, 15–18 mm long; sterile bracts 2, ca. 16–18 mm long, the laterals elliptic, obtuse, except for the thin, pale base purple-brown as in bracts, finely nerved, the inner sepal thinner, strongly stipitate, the blade narrowly elliptic with a broad, pale scarious border; corolla bright blue-violet, from base to lobe tips 30–33 mm long, the lobes spreading, ovate with fine dark nerves; stamens with anthers linear, pale, ca. 3 mm long, nearly basifixed, shallowly sagittate, on filaments ca. 1.5 mm long; ovary ellipsoid, ca. 5 mm long, tridentate at apex; style and stigma ca. 2 cm long, the slender style base exappendiculate, then dilating to a narrowly funnelform apex, the stigma funnelform with 3 ascending-triangular, papillate-edged lobes; capsule lanceoloid, 1.3–1.4 cm long, thickened throughout, valve tips narrowed acuminately to a blunt tip. Seeds broadly obovoid, ca. 1 mm long, light red-brown, longitudinally with 5–6 dark ribs per side, these connected by slightly finer cross-ribs to form a reticulum.

Distribution. Frequent in wet, boggy, rocky cold meadows and in *Bonnetia* woodland at and toward summit elevations, 1,900–2,300 m, Cerro Neblina along the Brazil–Venezuela border.

Additional material examined. BRAZIL. AMAZONAS: ridgeline, Venezuela–Brazil border, Cerro Neblina, Sep. 1985, *Gentry & Stein* 46712 (MO, VDB). VENEZUELA. TERRITORIO FEDERAL AMAZONAS: Cerro Neblina, Camp II, 2.5–3.5 km NE Pico Phelps, 17–22 Feb. 1984, *V. A. Funk* 6262 (US, VDB); Amazonas–Brazil frontier, summit Serra Neblina, 3 Dec. 1965, *Maguire & Pires* 60539 (paratype, F, NY); Valle de Titirico N of Pico Phelps, Cerro Neblina, 1 Dec. 1984, *Kral with Brewer-Carias* 71922 (NY, VDB, VEN); Brazil frontier, Planicie de Zuloaga, Río Titirico, 10–15 Oct. 1970, *Steyermark*

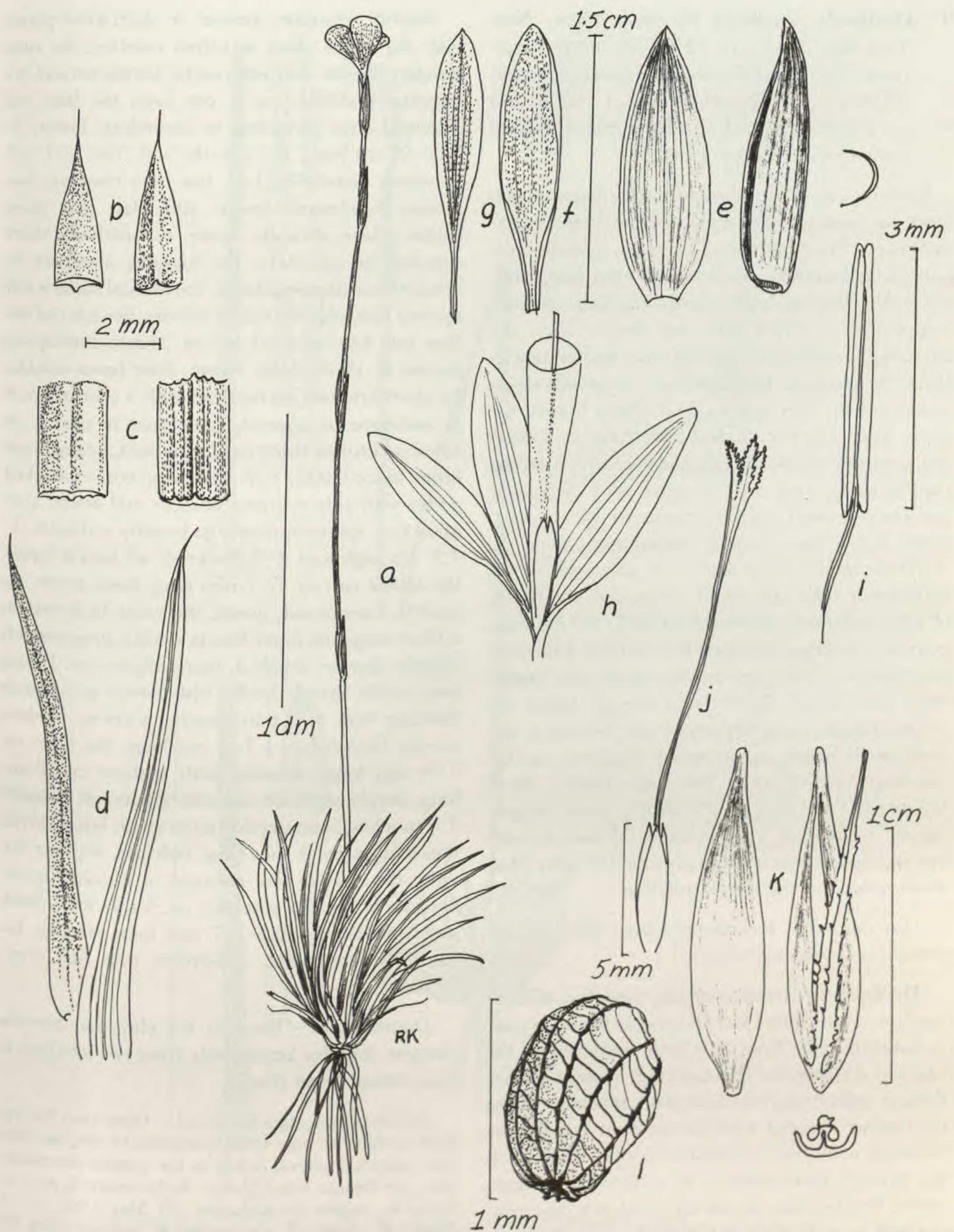


FIGURE 10. *Abolboda neblinae* (Kral with Brewer-Carias 71922).—a. Habit.—b. Leaf tip, adaxial side (left) and abaxial side (right).—c. Sector of leaf midblade, adaxial side (left) and abaxial side (right).—d. Two leaves.—e. Bract, spread, outer side (left), side view (right).—f. Lateral sepal.—g. Inner sepal.—h. Sepals spread so as to show corolla base, gynoecial base.—i. Stamen.—j. Gynoecium.—k. Views of capsule valve and placentation.—l. Seed.

103754 (NY, US), 17 Apr. 1984, Gentry & Stein 46712 (MO, VDB).

This species is locally abundant atop Cerro Neblina and is, on a basis of foliar features, subequal

and ecarinate sepals, corollas, stamens, fruit, and seeds, a part of a sharply distinguishable complex, which it forms with *Abolboda paniculata* and *A. uniflora*.

9. ***Abolboda uniflora*** Maguire, Mem. New York Bot. Gard. 10: 12. 1958. TYPE: Venezuela. Territorio Federal Amazonas: summit of Cerro Duida, Brocchinia Hills, 1,700–1,980 m, 1 Sep. 1944, *J. A. Steyermark* 58169 (holotype, F). Figure 11.

Glabrous, rosulate perennial, the stems short, stout, the rosettes in dense clumps, the roots spongy-thickened. Principal leaves erect to spreading-recurved, grass-green, mostly 2–2.5 cm long, stiff, the pale, clasping bases mostly triplinerved, otherwise thin, tapering into and shorter than the narrowly linear blades, these in cross section mostly thick, 3–4-angled, blunt with an excurved, short, mucro-prickle, the upper side 3-ribbed toward the blade base with the central rib strongest, toward the apex unicostate, the abaxial side with a strong median costa from base to near apex. Scapes 1 per rosette, erect, purple-brown, to 48 cm long, terete and striate-costulate toward apex, there ca. 1.5 mm thick; scape bracts 7 pairs, these ca. equidistant along the scape, appressed, the bracts of a pair subequal, lance-oblong, 1.5–1.8 cm long, convex, subulate-acuminate with narrow, pale scarious borders and purple-brown backs, the uppermost pair slightly shorter and directly below the terminal spike, the penultimate pair bearing a second, nearly sessile, spike; spikes fusiform, ca. 1.5 cm long, colored as in the scape bracts, the 2 bracts ca. 1 cm long, lance-oblong, acute or acuminate, subtending a single flower; flowers in number and dimensions of parts presumably as in *Abolboda neblinae*, the closest relative.

Distribution. Known only from the type collection, not collected since.

The limited material available, consisting of three specimens (of which I have seen only the holotype), is distinguishable from *Abolboda neblinae* on the basis of its shorter, less-tapering, blunter-tipped, thicker, and strongly 3–4-angled leaf blades. When (if) further material with mature fruit and flowers becomes available, a decision can be made as to the precise relationship of *A. uniflora* to *A. neblinae*. On the basis of existing evidence, the relationship is very close and perhaps varietal.

10. ***Abolboda abbreviata*** Malme, Ark. Bot. 19(13): 5. 1925. TYPE: Brazil. Pará: Campos do Ariramba, 7 May 1912, *A. Ducke*, Herb. Amaz. Mus. Para 11895 (lectotype, S; isotypes, K, MG, NY, RB, U, US). Figure 12.

Smooth, rosulate, annual or short-lived perennial, the stems short in tufted rosettes, the roots slender, fibrous. Earliest rosette leaves several, triangular, scalelike, ca. 1 cm long, the later and principal ones spreading to ascending, linear, 3–7.5(–9) cm long, the sheaths soft, thin and multicostate, convex-backed, the base clasping, narrowing to elongate-linear, stiff, flat, pale green blades, these abruptly acute, eccentrically short-subulate or apiculate, the margins a narrow in-crustate-cartilaginous band, the abaxial surface with several fine, slightly raised nerves, the adaxial surface with fine indented nerves. Scapes overtopping leaves, 8–19 cm long, terete, their bases enfolded by short bracteal leaves, and with 1 pair of bracts at midscape or upward, sometimes to near 1 cm below spike, and there ca. 1 mm thick; scape bracts erect, lance-linear, 1–1.5 cm long, convex-backed, green with pale scarious borders and acute, apiculate tips; spikes narrowly to broadly turbinate, 1–1.5 cm high and 4–5-flowered; all bracts fertile, the lowest one ca. 5–7 mm long, lance-ovate, the median zone broad, green, the costa excurrent as a blunt cusp, the inner bracts similar, progressively slightly shorter; sepals 2, lance-elliptic, ca. 10 mm long, acute, sharply keeled with narrow green bands flanking keel and thin, entire, scarious borders; corolla blue-violet, 1.7–2 cm long, the lobes ca. 7–9 mm long; stamens with anthers ca. 2 mm long, deeply sagittate and emarginate, on filaments 1.5 mm long; staminodia not evident; lateral stylar appendages ca. 1 mm long, reflexed, stipitate-clavate, the median one reduced to a nub. Capsule obovoid to broadly ellipsoid, ca. 5 mm long. Seeds angulate-obovoid, 0.5–0.7 mm long, strongly but narrowly few-ribbed, red-brown with fine cross-etching.

Distribution. Rare in low-elevation riverine campos, thus far known only from two localities in Amazonian Brazil (Pará).

Additional material examined. Other than the type there seem to be only three specimens to cite, but these have amplified several details in the original description. They are BRAZIL. PARÁ: Campo do Jaramacarú, perto do Barracão, região do Ariramba, 26 May 1957, *G. A. Black*, *W. Egler*, *P. Cavalcante* & *Antonio Silva* 57-19603 (NY); Obidos, Jaramacarú River, overflowed and sandy field, 27 May 1957, *W. A. Egler* 271 (US), 2 June 1957, *P. Cavalcante* 173 (US).

On the basis of most characters, this rare species appears to be part of a complex including *Abolboda bella* and *A. sprucei*. From comments on some labels it would seem that the plant is very localized but quite abundant within a small geographic area.

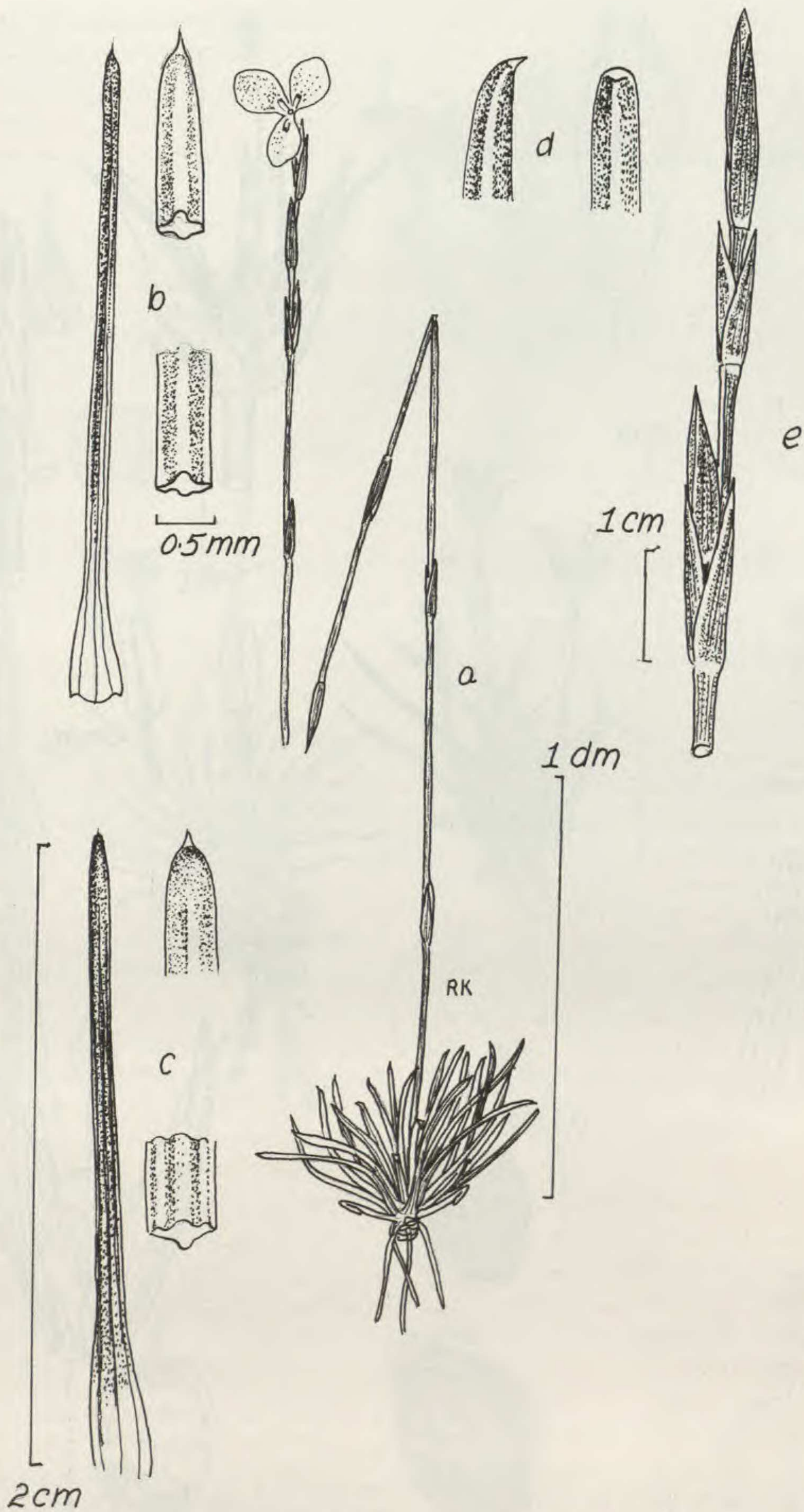


FIGURE 11. *Abolboda uniflora* (Steyermark 58169).—a. Habit.—b. Abaxial side of principal leaf (left); leaf apex (above, right); midsector of leaf blade (below, right).—c. Adaxial side of principal leaf (left); leaf apex (above, right); sector of midblade (below, right).—d. Two views of leaf apex, side view (left) and abaxial view (right).—e. Inflorescence, showing two spikes.

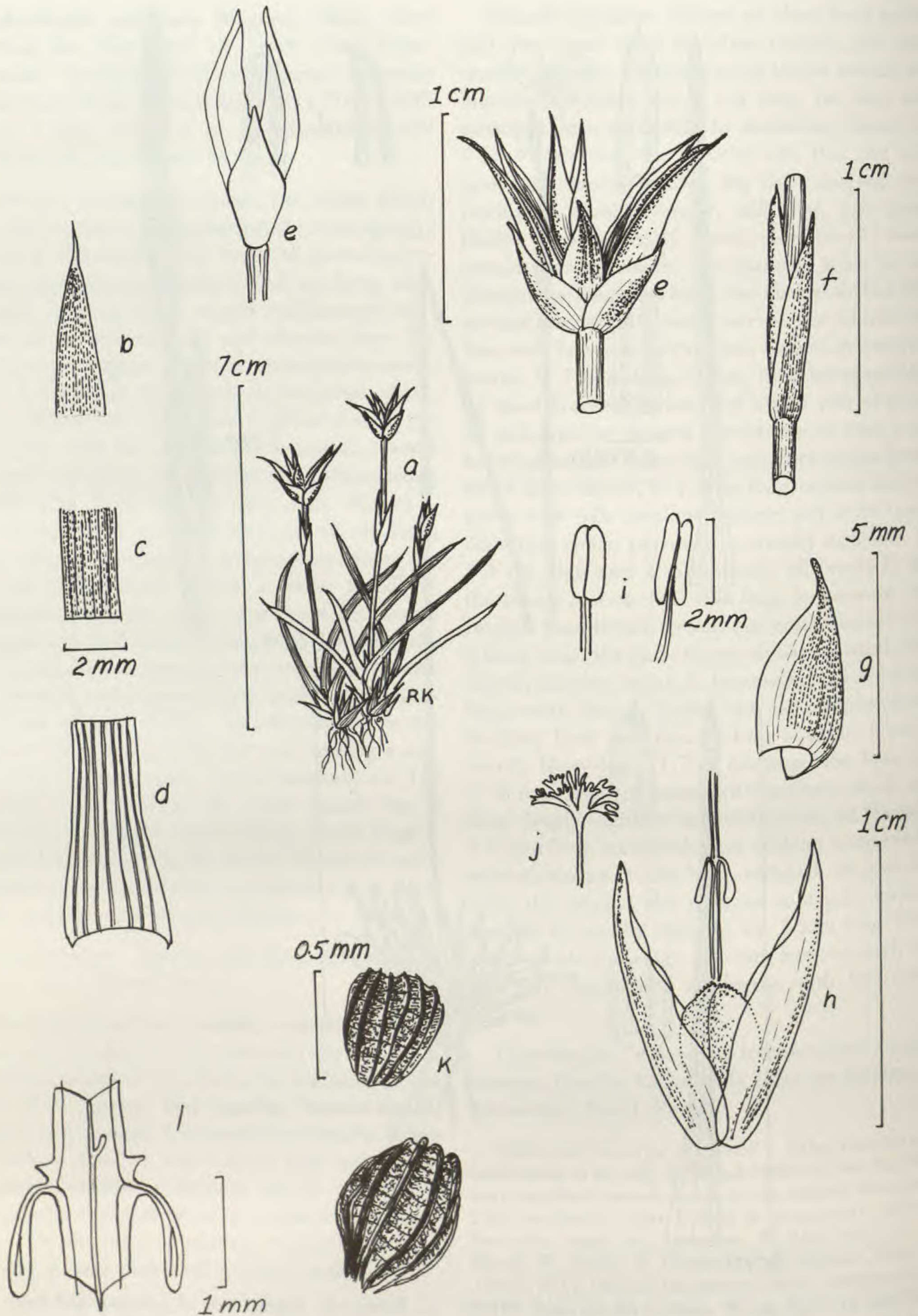


FIGURE 12. *Abolboda abbreviata* (A. Ducke, *Herb. Amaz. Mus. Para* 11895; Cavalcante 173; Egler 271).—a. Habit.—b. Leaf apex.—c. Sector of midblade, adaxial view.—d. Leaf base, abaxial side.—e. Spike (right); idealized view of spike base showing basal bract and its lateral sepals (left).—f. Scape bracts.—g. Inner spike bract.—h. Lateral sepals with enclosed ovary and style base.—i. Anthers.—j. Stigma.—k. Seeds, showing size range.—l. Style base with appendages.

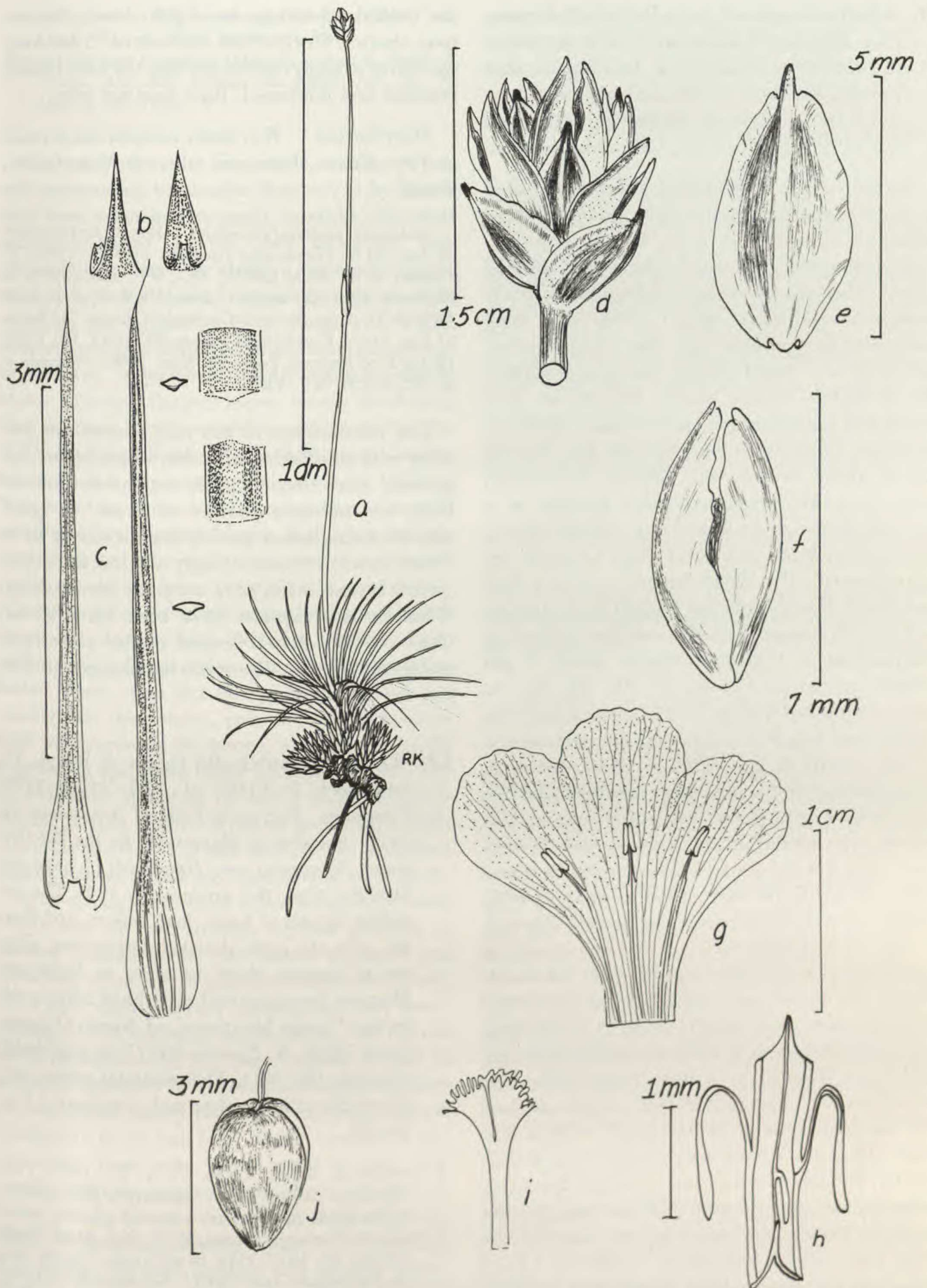


FIGURE 13. *Abolboda egleri* (W. A. Egler & Raimundo 1271; Plowman, Rosa & Rosario 9714).—a. Habit.—b. Early rosette leaves, adaxial side (left), abaxial side (right).—c. Two secondary rosette leaves, adaxial side (left), abaxial side (right), at far right two short sectors of blade.—d. Spike.—e. Lowest bract.—f. Corresponding sepal pair.—g. Corolla and stamens.—h. Style base and appendages.—i. Stigmatic apex.—j. Capsule.

- 11. *Abolboda egleri*** Lyman B. Smith & Downs, Proc. Bol. Soc. Washington 73: 258, fig. 10a-b. 1960. TYPE: Brazil. Pará: Alto Tapajos, Rio Cururú, Rio Ereri, on wet sandy places, 8 Jan. 1960, *W. A. Egler & Raimundo 1271* (holotype, US; isotypes, MG, NY). Figure 13.

Caespitose, smooth perennial, the rosettes tufted on stubby branches from a thick, knotty, much-branched rhizome, the roots thickened-spongy. Leaves dimorphic, the initial rosette buds forming closely imbricate, ascending or spreading, narrowly triangular, rigid leaves up to 1.5 cm long, these with subulate, spinulose tips, the abaxial surface with a strong, raised midrib, the adaxial surface flat or slightly convex, faintly few-nerved; later leaves of a rosette abruptly much longer, relatively narrower, (2-)3-5 cm long, the thin base broadly dilated above its narrower clasping attachment, pale, 5-nerved, thence narrowing abruptly to a narrowly linear, gradually tapering, subulate-tipped, silvery-green blade, this apically long-spinulose, the adaxial surface at midblade slightly convex or level and finely few-nerved, the abaxial face strongly and broadly costate medially, the blade toward tip subquadrate or trigonous. Scapes mostly 1 per rosette, terete, gray-green, (7-)10-20(-40) cm long, sheathed at base by 2-3 scarious, setaceous-tipped basal bracts 1-2 cm long, the scape bracts 1 pair, mostly at ca. midscape, erect, subequal, lance-oblong, 8-15 mm long, conduplicate, the convex backs pale green with tints of purple, low-ribbed, with strong, broad, scarious pale borders narrowing to blunt mucros, these sometimes tipped with a short, slender hair; spikes at maturity ellipsoid to narrowly ovoid (or by seeding time obovoid), 1-1.5 cm long, pale, mostly 4-flowered or with an additional pair of undeveloped flowers, all bracts fertile, the lowest pair slightly larger and firmer than the inner ones, broadly ovate, 5-6 mm long, with thickened, convex, green or purple-tinged medial areas bisected by a pale, raised costa, this excurrent as a short, stubby blunt mucro, the border scarious, pale or submarginally with a lilac band, the apex emarginate; sepals 2 per flower, ovate, strongly conduplicate, curvate-lanceolate when viewed from the side, 7-8 mm long, broadly acute or blunt at tip, sometimes mucronulate, the wide keel entire, chartaceous; corolla ca. 12-13 mm long, the obovate lobes shorter than the tube; staminodia not evident; stamens with anthers ca. 1.5-2 mm long, oblong, the thecae slightly divergent below, on filaments ca. 2 mm long; style base strongly alate-triquetrous, the appendages produced ca. 3 mm above the ovary and with the lateral ones filiform-clavate, reflexed, 2 mm long,

the central appendage set slightly lower, filamentous, shorter. Unripe fruit obovoid, ca. 3 mm long, the valves strongly bilobed apically, the lobes broadly rounded and thickened. Ripe seed not seen.

Distribution. Wet sandy campos and savanna at 100-450 m, Pará and adjacent Mato Grosso, Brazil.

Additional material examined. BRAZIL. MATO GROSSO: 38 km SE of Pontes and Lacerda, 30 Oct. 1985, *W. Thomas et al. 4683* (INPA, MG, NY, VDB); Serra do Roncador NNE Xavantina, 7 Dec. 1969, *G. & L. Eiten 9800* (NY). PARÁ: Serro do Cachimbo Corrego São Bento, 21 Feb. 1977, *Kirkbride & Lleras 2973* (NY, US, VDB); 16 km E of Represa Tucuri, 18 Mar. 1980, *Plowman et al. 9714* (GH, NY, VDB).

The relationships of this rare species are definitely with *Abolboda pulchella*, which occurs, apparently more frequently, throughout the Amazon Basin and northern planalto of Brazil. *A. egleri* may be distinguished quickly from it mostly by its denser rosette of more strongly tapered, firm, more costate leaves, which have a definite silvery sheen. While no ripe capsules have been found so far, those available show a broader outline and a more umbilicate summit. The styler appendages are longer and more slender.

- 12. *Abolboda pulchella*** Humb. & Bonpl., Pl. Aequinoct. 2: 1109, pl. 114. 1813. TYPE: Venezuela. Territorio Federal Amazonas: vicinity "mission de Maypures" by the Río Orinoco, *Alexander von Humboldt* [I have not seen the type, this presumably at P. The excellent figures of habit, leaf, bracts, and flowers, plus the quite detailed description, allow me to suggest these to serve as lectotype. Maguire has annotated a Richard Spruce collection "prope Maypures, ad flumen Orinoco, Junio 1864, *R. Spruce 3651*" as a probable topotype (K, NY). This material agrees satisfactorily with the plate and protologue]. Figure 14.

- A. brasiliensis* Kunth, Enum. Pl. 4: 26. 1843. TYPE: "Brasilia, *Sellow legit*" (lectotype, BR; isolectotypes, K, L, S).
A. vaginata (Sprengel) Nilsson, K. Sv. Vet.-Akad. Handl. 24(14): 63. 1892. TYPE: Brazil. Goiás: "marsh Lima de Natividade, July 1840," *Gardner 4024* (lectotype, here designated, K; isolectotype, NY).
A. longifolia Malme, Bih. Sv. Vet.-Akad. Handl. 22: (Afd. III, No. 2): 20. pl. 2. 1897. TYPE: Brazil. Mato Grosso: "lugar arenoso-umido, Arica, entre São Jeronimo e Cuiabá, 17 Feb. 1894," *Malme 1402* (lectotype, S; isolectotype, S).
A. gracilis Huber, Bol. Mus. Goeldi Paraense Hist. Nat. Ethnogr. 5: 323. 1909. TYPE: Brazil. Pará: "campos

de Ariramba, Rio Trombetas, 22 Dec. 1906," *A. Ducke Hb. no. 8074* (lectotype, MG).

A. pulchella var. *longifolia* (Malme) Lyman B. Smith & Downs, *Arq. Bot. Estado São Paulo*, nov. ser. 4, fasc. 2: 26. 1966.

Glabrous, solitary or caespitose, slender perennial, perennating by slender rhizomes or by lateral buds from ascending or erect caudices, the roots spongy-thickened. Leaves often dimorphic with "juvenile" rosettes of stubby, triangular-linear, strongly tapering blades, the smallest leaves often scalelike, the largest to 2 cm long, with broad, clasping, scarious-bordered bases, tapering upward to subulate, triquetrous, mostly spinulose-tipped blades; principal (larger) leaves mostly developing later on shoot, highly variable in outline and length, 2–15 cm long, those of the short range mostly recurved and linear-triangular, strongly tapering from broad (to 4 mm wide) clasping bases into stiff, compressed by lingulate blades, these thus strongly convex-backed, the adaxial face smooth or scarcely raised-nerved, the lower (abaxial) side more strongly nerved, the costa raised; in the longer leaf length range, the clasping base narrower, thinner, gradually or abruptly narrowing to narrowly linear, less folded, more often flat blades, both sorts of leaf usually with thin, entire, pale contrasting borders, both with variously thickened, attenuated, usually triquetrous tips, these either subulate or short-conic, sometimes spinulose or with a short, eccentric prickle. Scapes 1–several per rosette, mostly stiffly erect, distally 0.8–1.5 mm thick, terete, less often slightly angled or sulcate, sheathed at base by 2–3 lance-oblong, imbricate, scarious-bordered basal bracts with narrow, strongly nerved, greenish or maroon median areas, the midrib strongest and often long-excurrent or spinulose; scape bracts usually 1 pair, slightly to very unequal, narrowly lance-oblong, 1.5–3 cm long, conduplicate, the convex backs raised-nerved, the costa forming a blunt or subulate, spinulose or eccentrically spinose mucro or cusp; spikes mostly ellipsoid to narrowly obovoid (turbinate), 8–15 mm long, highly variable in pigmentation, from pale yellow-green to deep red-purple or brown-purple, the bracts (2–)4(–6), the lowest usually broader and slightly longer than the inner, all navicular, broadly ovate, 6–11 mm long, with broad, scarious borders and broadly ovate, thickened medial areas, these few-ribbed, the midrib (costa) mostly excurrent as a short, thick cusp, this sometimes with a short eccentric prickle; sepals 2, lateral, lanciform, ca. as long as the subtending bract but slightly elevated above its base, therefore with tips frequently exsert, the sides scarious, the keel firm, curved, entire, excurrent or not as the

acute apex; corolla 14–15 mm long, the lobes broadly obovate to ovate, ca. as long as the tube, light blue-violet; staminodia not evident; anthers deeply emarginate and sagittate, oblong, 2–2.5 mm long on flattened filaments 2–3 mm long; style base narrow, sharply triquetrous, with 2 reflexed, broadly short-clavate lateral appendages and a low, auriclelike median appendage, all ca. 2–3 mm above ovary tip, the laterals each with an upswept short-oblong auricle at its base; style apex 3-branched, each branch apically broadly dilated and fimbriate-papillate. Capsule broadly ellipsoid or short-cylindric, ca. 4 mm long, rather uniformly firm-valved, apically umbilicate, each valve with 2 low lobes. Seeds nearly black, variously angled, mostly broadly obovoid, 0.5–0.6 mm long, coarsely irregularly thick-ribbed longitudinally, the intervals paler, broad, nearly smooth.

Distribution. Moist to wet sandy peats, clays or silts, mostly fine-textured substrate, in grass-sedge campos, 25–1,600 m, from French Guiana west to the low savannas of southeastern Colombia, southward through Amazonian Brazil to Minas Gerais and São Paulo.

Additional material examined (a selection to represent geographical and morphological range). BRAZIL. AMAZONAS: Transamazonica, Pedra Caida, 13 Apr. 1983, *N. A. Rosa et al. 1062* (MG, NY, VDB); Rio Branco, 1909, *Ule 7762* (K). BAHIA: Serra do Rio Contas, 21 Mar. 1977, *Harley 19785* (NY, US). DISTRITO FEDERAL: Brasilia, dez. 1961, *Cobra & Belem 106-61* (NY, UB). GOIAS: 16–17 km N Alto Paraiso, 8 Mar. 1973, *W. R. Anderson 6637* (F, K, MO, NY, U, US); Morro do Redondo, 7 Aug. 1895, *Glaziou 22284* (K, US); 7 km W of Veadeiros, 15 Feb. 1966, *Irwin et al. 12907* (F, GH, MO, US, VDB); Alto do Paraiso, 21 Mar. 1971, *Irwin et al. 32870* (F, K, NY, US, VDB); Jataí to Goiania, 1 Oct. 1963, *Maguire et al. 57001* (F, US). MATO GROSSO: Salgareira Bridge, Cuiabá, *Antonia & Assumcao 1456* (NY, this the "brasiliensis" morph); Serra do Roncador, NNE Xavantina, 6 Oct. 1968, *G. & L. Eiten 9140* (NY, UB); Santa Fe, Sidrolandia, 23 Jan. 1970, *Hatschbach 26047* (US); Rio Langrador, *Lindman A. 2421* (MO); Xavantina–Cachimbo Rd., *D. Philcox et al. 3432* (K). MINAS GERAIS: 35 km SW Gouveia, *Anderson et al. 35089* (MO, US); Carandai-Brejão, *Duarte 682* (US); Bom Sucesso, *M. Barreto 9659* (F); 5 km de Itacambira, *Kawasaki et al. 6608* (K). PARA: Alto Tapajos, Rio Cururu, *Anderson 10963* (F, MO, NY, US); campos do Ariramba, *Ducke, Herb. no. 11454* (US); Ilha do Marajo, *R. Lima 42* (US). RORAIMA: Rio Branco, *Maguire 40118* (K). GUYANA. St. Ignatius, *R. Goodland 335* (NY); Ite Swamp, *Goodland 884* (NY); Nuinatta, Rupununi River, *Jenman 5720* (K); Palaima Savanna, *J. G. Wessels Boer 801* (NY, U). SURINAM. Gros-savanna (prope km 103, *J. van Donselaar 722* (U); Sipaliwini Savanna, *Oldenburger et al. 959* (U). VENEZUELA. TERRITORIO FEDERAL AMAZONAS: Río Orinoco 2 km rio arriba de Macuruco, *Berry 792* (MO); Puerto Ayacucho to El Burro, *Davidse & Huber 14520* (MO, US); sabanas de Santa Barbara, *Huber &*

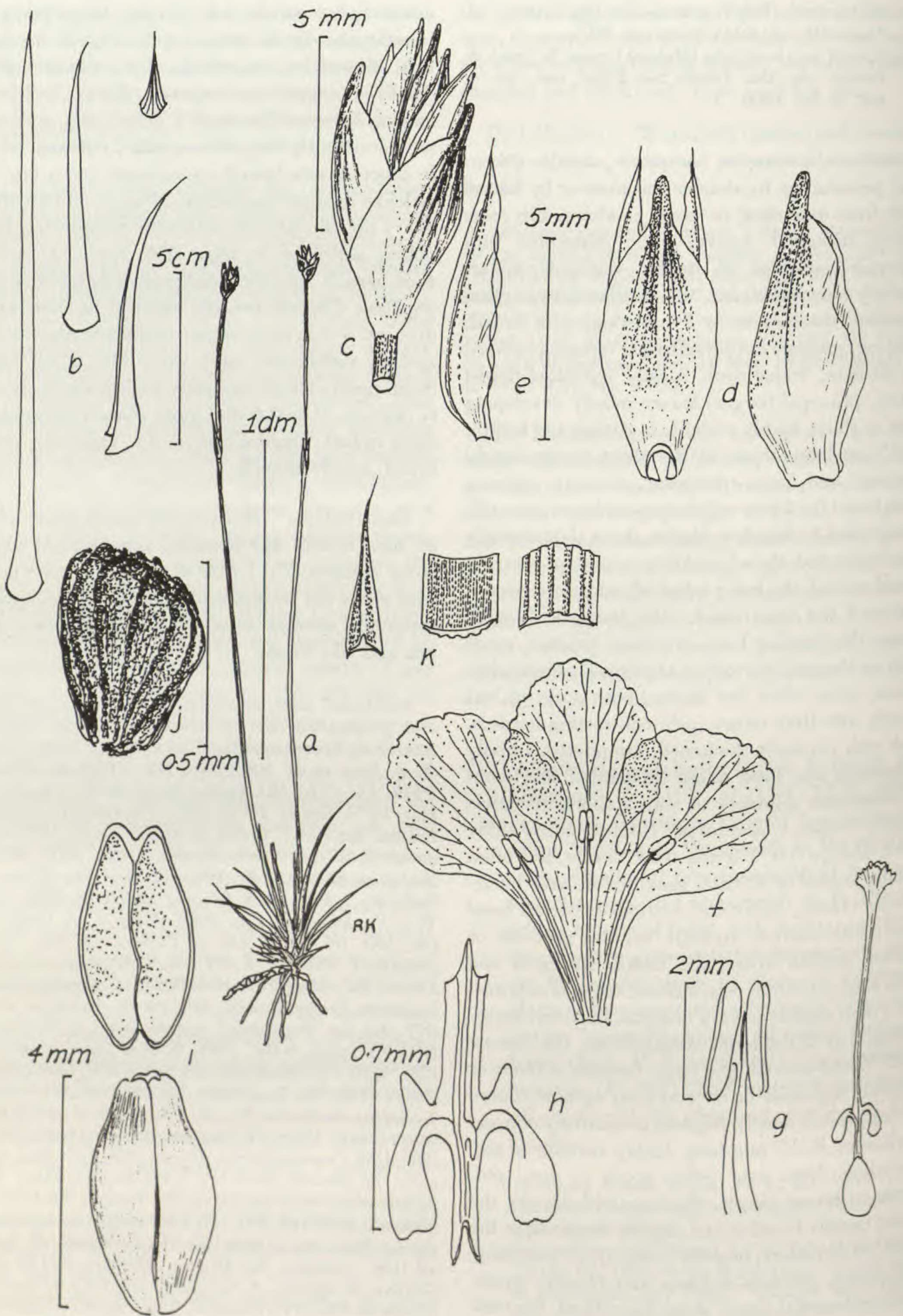


FIGURE 14. *Abolboda pulchella* (Irwin, Harley & Smith 32870; Kral & Huber 70731).—a. Habit.—b. Various leaf outlines.—c. Spike.—d. Fertile bract, external view (left), side view (right).—e. Lateral sepal.—f. Spread corolla, stamens.—g. Stamen (left); gynoeceium (right).—h. Stylar base with appendages.—i. Capsule (below), inner view of abaxial side (above).—j. Seed.—k. One type of leaf apex, abaxial side (left); two midblade sectors, adaxial side (center).

Tillett 5390 (US, VEN); bajo Río Ventuari, Huber 1958 (MO, NY, U, US); 30 km N Puerto Ayacucho, Huber 3806 (K, MYF, NY, VDB); 5 km NE Galipero, Kral & Huber 70731 (MO, VEN, VDB); Orinoco 10 km above mouth of Río Ventuari, Wurdack & Adderley 43688 (GH, US). ANZOATEGUI: Ciénaga del morichal del Tigrito, Pittier 15080 (US). BOLIVAR: 8–10 km SSE Yuruani, Huber & Febres 9181 (MYF, VDB); 3 km SW Peray-tepui, Huber & Alarcon 9689 (MYF, NY, VDB, VEN); Salto Apongua, Kral & Gonzalez 7041 (GH, MO, NY, US, VDB, VEN); Ruemeru, S of Mt. Roraima, Steyermark 59178 (F, K, NY, US); Urimán, Steyermark 75244 (NY); Agua Amena, Steyermark et al. 131437 (MO, VDB, VEN); between Ciudad Piar and S base of Cerro Bolívar, Wurdack 35751 (NY).

This is, along with *Abolboda americana*, the widest-ranging and most morphologically variable of the abolbodas; thus it is not surprising that the synonymy is so elaborate. In the Brazilian planalto *A. pulchella* is a common associate of *A. poarchon*, though where the two share the same wet campo *A. pulchella* tends to be lower, usually more slender, with narrower, thinner, more tapering leaves, narrower scapes, smaller and fewer-flowered spikes, and more slender rhizomes. Typically, the flowers of *A. pulchella*, while of about the same size and color, are open sooner in the day. Some recently described variations, such as the variety *longifolia* (Malme) Lyman B. Smith & Downs, have leaves and scapes in the long range of the above description, but with bracts similar to those in the type variety. However, such elongate-leaved extremes might be seasonal and moisture expressions, in that the same variation can be found to the north of the described Brazilian range (Pará, Mato Grosso). The variety of *intermedia* Lyman B. Smith & Downs, understood by them to be a variant with a larger number of flowers per spike and with spike bracts bristle-tipped, appears to me to be a part of *A. poarchon*.

13. *Abolboda scabrida* Kral, sp. nov. TYPE: Venezuela. Territorio Federal Amazonas: Depto. Río Negro, Cerro Aracamuni, summit, Proa Camp, medium height, semi-open forest, 28 Oct. 1987, R. Liesner & G. Carnevali 22598 (holotype, VEN; isotypes, MO, VDB). Figure 15.

Herba perennis densicaespitosa, praeter inflorescentiam et bases scabrida et scabrido-rugosa. Radices spongiosae. Caules breves, ascendentes, usque ad 2–3 cm longi, per bases persistentes veteras foliorum obtecti. Folia extima rosularum pro parte maxima vaginalia, anguste triangulata; folia principalia erecta vel expansa, leviter excurvata, 3–6 cm longa, ad basim dilatata, ca. 5-costata, sursum abrupte contracta, 2–3-costata; laminae 0.5–1 mm latae, pallide virides, leviter compressae, transversim irregulariter rugosae et tuberculatae; apices

gradatim vel abrupte contracti, incrassati, ad apicem obtusati vel excurvato-mucronati; margo leviter vel valde incrassata, scabra; paginae superiores planae aut leviter convexae, inferiores concavae vel planae aut prominente 2–3-costatae. Scapi solitarii, scabrosi, 6–10 cm alti, 0.5–0.7 mm lati, ad basim leviter compressi vel tricostati et sulcati, ad apicem teretes. Vaginae scaporum erectae, linearo-lanceolatae, subulatae, convexae, leviter striatae, inaequales, 2-jugatae, pari infimo basali, pari supero ca. $\frac{2}{3}$ distanti a basi scaporum, vaginis exteriores 1–1.5 cm longis, longitudine $\frac{3}{4}$ – $\frac{4}{5}$ interiores aequantibus. Spica anguste turbinata, 1.1–1.4 cm longa, pauciflora (flores praeter 4); bractee 2-jugatae, subdecussatae, lanceolatae, incrassato-subulatae, 1–1.4 cm longae, convexae, a medio ad apicem carinatae, scabridulae, ad apicem obtusae, mediane virides, late scariomarginatae. Sepala 2, lateralia, subopposita, lanceolata, inequilateralia, ca. 1 cm longa, curvata, anguste acuta, a medio ad apicem acute carinata scabridula. Corolla azurea, ca. 1 cm longa. Staminodia bibrachiata, brachiis planis, anguste oblongis, ca. 1 mm longis. Antherae oblongae, ca. 1 mm longae; filamenta ca. 1.5 mm longa. Appendices stylorum 3, recurvatae, clavatae, 1-redactae. Capsula obovoidea, ca. 2.5 mm longa, obscure trilobata, valvis ad apicem inflexis et erosis. Semina late asymmetrice obovoidea, ca. 0.5 mm longa, longitudine valde 12–14-costata, anthracina.

Perennial, densely caespitose herbs, all but the bases and inflorescence scabrid and scabrid-rugose. Roots spongy. Stems short, ascending up to 2–3 cm long, the bases covered by old leaves. Outer leaves of a rosette for the most part sheath, narrowly triangular; principal foliage leaves erect to spreading, slightly recurved, 3–6 cm long, dilated at base, ca. 5-costate, then above abruptly contracted, 2–3-costate; blades 0.5–1 mm wide, pale green, somewhat compressed, transversely irregularly rugose and tuberculate; apices gradually to abruptly narrowed, thickened, at tip obtuse or excurved-mucronate; margin slightly to very thickened, scabrid; upper surface flat to somewhat convex, the lower surface concave to flat or prominently 2–3-costate. Scape solitary, scabrous, 6–10 cm high, 0.5–0.7 mm wide, at base somewhat compressed to tricostate and sulcate, toward apex terete. Scape bracts erect, linear-lanceolate, subulate, convex, slightly striate, unequal, in 2 pairs, the lower pair basal, the upper pair ca. $\frac{2}{3}$ way up from scape base, the lower ones 1–1.5 cm long, $\frac{3}{4}$ – $\frac{4}{5}$ as long as the upper. Spike narrowly turbinata, 1.1–1.4 cm long, few-flowered (flowers usually 4); bracts 2 pairs, subdecussate, lanceolate, thickened-subulate, 1–1.4 cm long, convex, from middle to tip carinate, scabridulous, at tip obtuse, medially green with margins broadly scarious-bordered. Sepals 2, lateral, subopposite, lanceolate, inequilateral, ca. 1 cm long, curvate, narrowly acute, from middle to tip sharply and scabridulously carinate. Corolla blue, ca. 1 cm long. Staminodia bibrachiata, the branches flat, narrowly oblong, ca. 1 mm long.

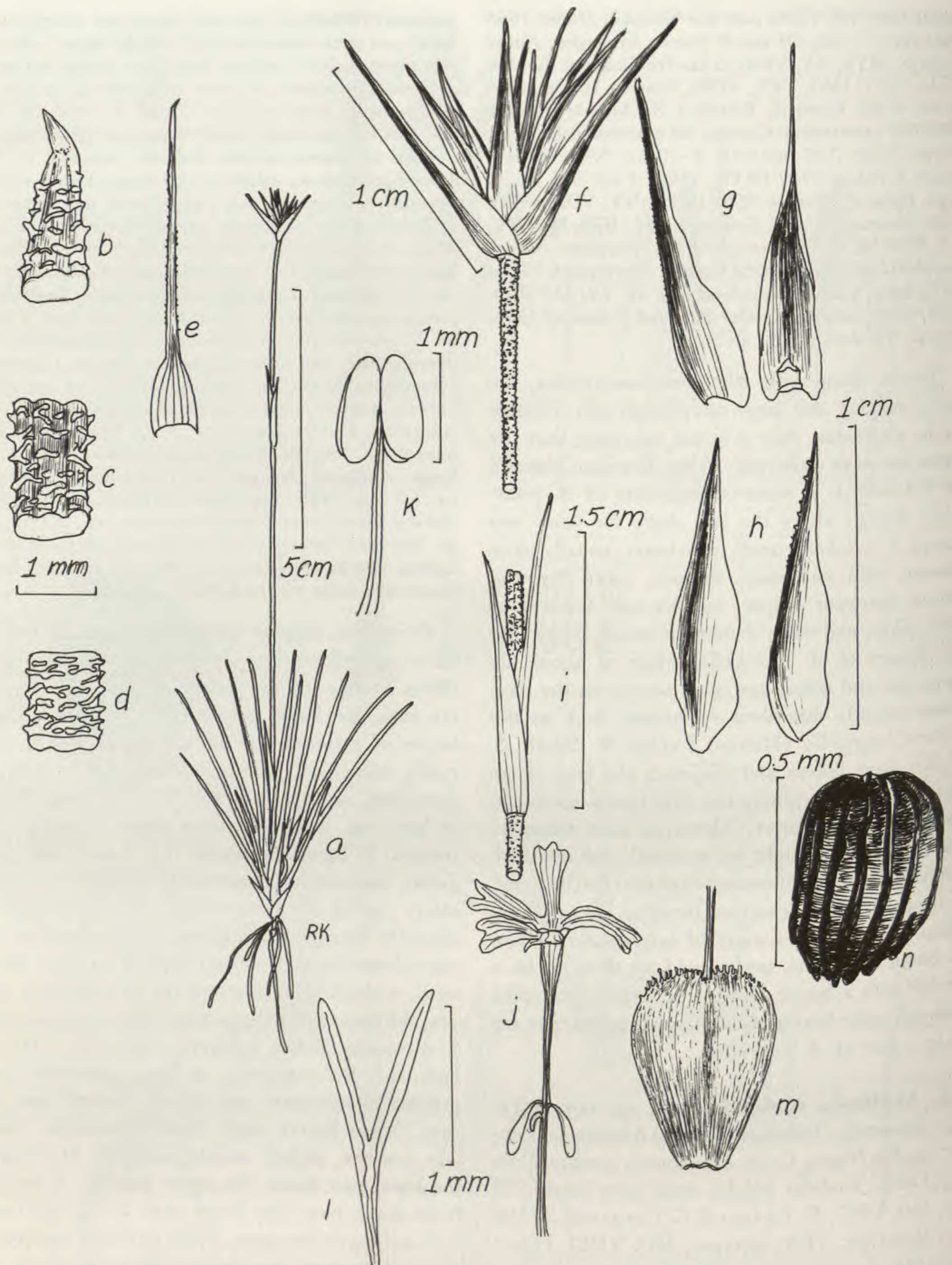


FIGURE 15. *Abolboda scabrada* (Liesner & Carnevali 22598).—a. Habit.—b. Leaf tip.—c. Sector of leaf blade, abaxial side.—d. Sector of leaf blade, adaxial side.—e. Leaf.—f. Spike and upper scape.—g. Outer spike bract, side view (left), adaxial view (right).—h. Lateral sepal, abaxial side (left), side view (right).—i. Scape bract pair, side view.—j. Style, showing appendages and stigma.—k. Stamen.—l. Staminate leaf.—m. Capsule and style base.—n. Seed.

Anthers oblong, ca. 1 mm long; filaments ca. 1.5 mm long. Styler appendages 3, reflexed, claviform, 1 appendage reduced. Capsule obovoid, ca. 2.5 mm long, obscurely trilobed, the valves at apex inflexed and erose. Seeds broadly asymmetrically

obovoid, ca. 0.5 mm long, longitudinally strongly 12-14-ribbed, coal black.

Distribution. Known only from the type.

Abolboda scabrada is closely related to *A. acic-*

ularis Idrobo & Lyman B. Smith, particularly to the variety *granularis* Maguire, but foliage and scapes are rugose and scabrid (rather than smooth or granular), petals are blue (rather than white), the staminodial character is unique, and the seeds are smaller.

14. *Abolboda dunstervillei* Maguire ex Kral, sp. nov. TYPE: Venezuela. Territorio Federal Amazonas: summit of Cerro Avispa, Río Siapa, 1°30'N, 65°51'W, 1,510 m, 5 Dec. 1972, G.C.K. & E. Dunsterville s.n. (holotype, NY). Figure 16.

Planta perennis, dense rosulata, densicaespitosa; radices graciles; caules breves. Folia principalia erecta vel leviter expansa, rigida, 2–4 cm longa, pallide viridia, glabra, aut ad basim et apicem versus leviter papilloso-rugulosa; vaginae scariosae, ad basim 2.5–3.5 mm latae, 5-costatae, sursum gradatim contractae; laminae vaginis 2–3-plo longiores, anguste lineares, 9–10 cm altae, rectae, teretes, 0.7–0.8 mm crassae, ecostatae, transversim tuberculato-rugosae; bractae scaporum 1-jugae, ad circum medium scaporum involutae, oblongo-lanceolatae, leviter impares, bracteis extimis valde convexis, viridibus, margine late scariosis, acutis, mucronatis, leviter imparibus, bractea extima 9–10 mm longa, bractea intima 12–14 mm longa. Spicae turbinatae, circa 1 cm longae, 4–5-florae, si 5-florae hoc detactae; bractee 4–5, lanceolatae, convexae, virides, margine late scariosae, a medio ad apicem carinatae, subulatae, ad apicem excentricè mucronatae, usae, duabas extimis 9–10 mm longis, ceteris aequantibus vel parum longioribus. Sepala 2, leviter inequilateralia, navicularia, 6.5–8 mm longa, acuta, valde unicostata, costis breviter excurrentibus. Corolla, stamina et apex stylorum non visa. Appendices stylorum 2, clavatae, pendulae, ca. 1 mm longae. Capsula obovoidea 2.3 mm longa, valvis ad apicem incrassatis, obtusis vel leviter emarginatis, tuberculato-papillosis. Semina late obovata, ca. 0.5 mm crassa, atroferruginea, longitudine spiralter 12–14-costata.

Plants perennial, densely rosulate, densely caespitose; roots slender; stems short. Principal leaves erect to slightly spreading, rigid, 2–4 cm long, pale green, smooth or slightly papillose-rugulose at base and toward apex; sheaths scarious, at base 2.5–3.5 mm wide, 5-costate, gradually narrowing upward; blades 2–3 times longer than the sheaths, narrowly linear, 0.4–0.7 mm wide, for the most part straight, compressed, triplinerved, toward the tip thickened, at tip obtuse, eccentrically mucronate. Scapes linear, 9–10 cm high, straight, terete, 0.7–0.8 mm thick, ecostate, transversely tubercular-rugose; scape bracts 1 pair, toward midscape involute, lance-oblong, slightly unequal, the outer one 9–10 mm long, the inner 12–14 mm long. Spikes turbinate, ca. 1 cm long, 4–5-flowered, fifth flower, if present, reduced; bracts 4–5, lanceolate, convex, green with broad scarious margins, carinate from middle to tip, subulate, at tip eccentrically

mucronate, blunt, the outer two 9–10 mm long, equaling the rest or a little longer. Sepals 2, slightly inequilateral, navicular, oblong-elliptic, 6.5–8 mm long, acute, strongly but narrowly unicostate, the sides thin, the costa entire, short-excurrent. Corolla, stamens, and apex of style not seen. Stylar appendages 2, clavate, reflexed, ca. 1 mm long. Capsule obovoid, 2.3 mm long, the valves apically thickened, obtuse or slightly emarginate, tuberculate-papillate. Seeds broadly obovoid, ca. 0.5 mm thick, dark red-brown, longitudinally spirally 12–14-costate.

This plant, thus far known only from the type, is closest taxonomically to the varieties of *Abolboda acicularis* and to *A. scabrida* Kral. From the former it is distinguished by its uniform leaves, which are flatter and have blunter, uniformly eccentrically mucronate tips, and by the coarser indument of scape. From the latter it is distinguished by its smoother, flatter leaf blades and by its smooth, rather than granular-papillate, bract costas and sepal keels.

15. *Abolboda acicularis* Idrobo & Lyman B. Smith, Caldasia 6: 250. 1954. TYPE: Colombia. Vaupés: terrestrial herb, savanna de Yapoboda, Alto Río Cuduyari, 10 Dec. 1943, P. H. Allen 3150 (holotype, COL; isotypes, NY, US).

15a. *Abolboda acicularis* var. *acicularis*. Figure 17.

Tufted glabrous perennial, or rosettes solitary, the stems short or slightly elongate, in either case invested by chaffy remnants of old rosette leaves, the roots spongy-thickened. Initial rosette leaves (including those of new shoots) short, linear-subulate, mostly 1 cm long or less, straight or curved outward, stiff, bases broad, pale, thin, clasping, triplinerved, broadly scarious-margined, abruptly narrowed to linear-triangular, thickened blades, these subulate-tipped or with short prickles, pale to deep green, the adaxial face plane or lingulate with pale hyaline, narrow border, the abaxial side convex, usually strongly pale-costate medially, these initial leaves sometimes passing directly to basal scape bracts but more often abruptly changing to spirals of longer rosette leaves, these 1.5–3(–5) cm long, with narrower, shorter bases in relation to the longer, more evenly linear, mostly recurved blades 0.3–0.5 mm broad, these eccentrically mucronate, mucronulate or short-setaceous-subulate, thickened, mostly plane or lingulate adaxially, convex and commonly costate medially, in cross section triangular. Scapes 1–few per rosette, erect or

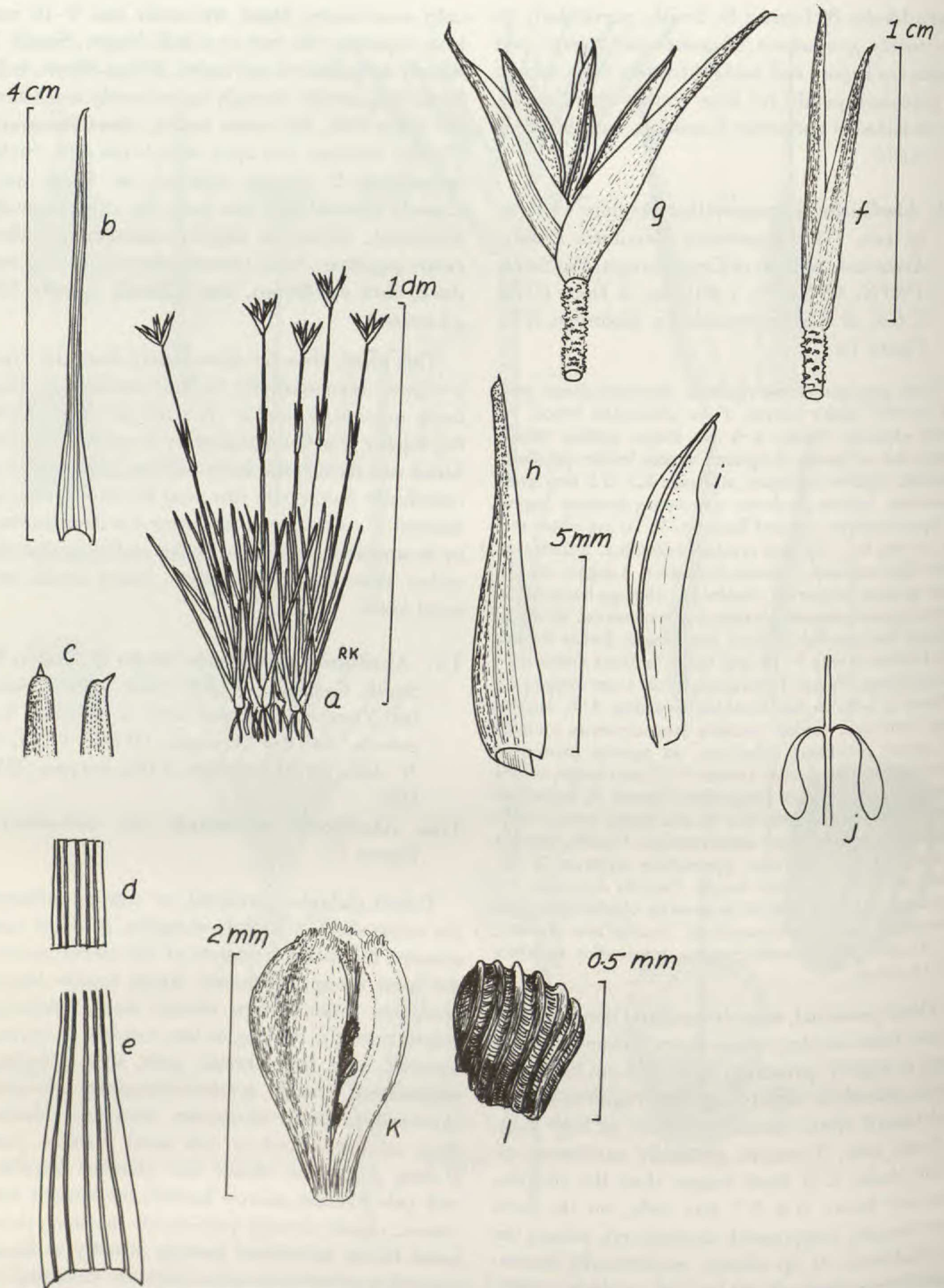


FIGURE 16. *Abolboda dunstervillei* (C. C. K. & E. Dunsterville s.n.).—a. Habit.—b. Leaf.—c. Adaxial (left) and side (right) views of leaf tip.—d. Sector of midblade, abaxial side.—e. Leaf base, abaxial side.—f. Scape bracts.—g. Spike.—h. Side view of basal bract of spike.—i. Lateral sepal.—j. Stylar appendages.—k. Capsule.—l. Seed.

ascending, terete, (7-)10-30 cm long, pale green, smooth or papillose, sometimes longitudinally striate, the bracts unequal, those at scape base usually 3-4, conduplicate-clasping, imbricate-spiral, line-

ar, unequal, the innermost longest, 2-3 cm long, stramineous, with broad scarious borders and narrow firm costae, these tapering to subulate-setaceous tips; scape bracts rarely lacking, mostly 1

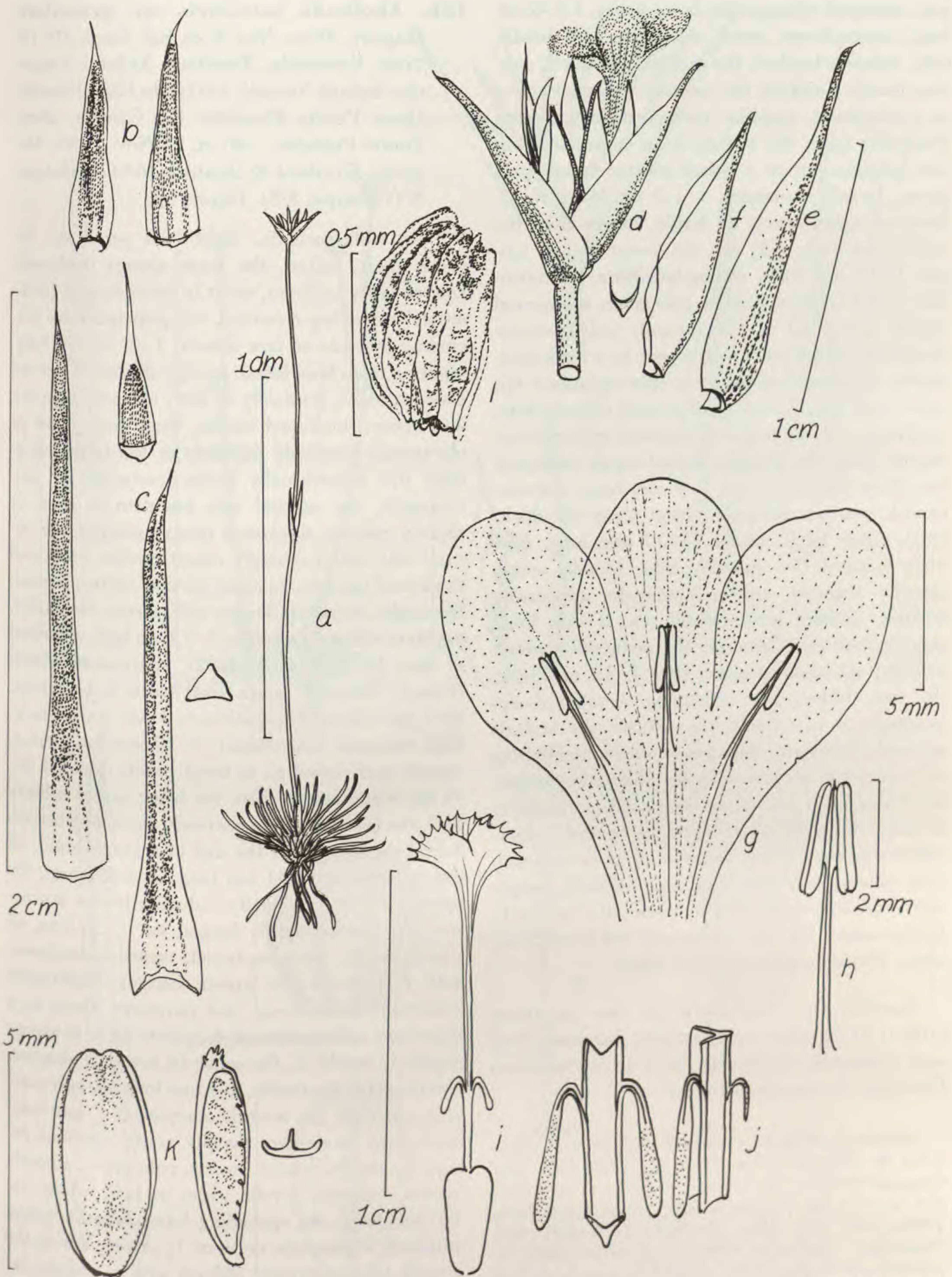


FIGURE 17. *Abolboda acicularis* var. *acicularis* (Huber 3938; Wurdack & Adderley 42851).—a. Habit.—b. Short rosette leaf, abaxial view (left), adaxial view (right).—c. Long rosette leaf, adaxial view (left), a tip (middle), abaxial view (right).—d. Spike.—e. Lowest spike bract.—f. Lateral sepal.—g. Spread corolla with stamens.—h. Stamen.—i. Gynoecium.—j. Enlarged style base showing lateral appendages (left), a side view showing reduced appendage (right).—k. Capsule (left), a side view of a valve (right).—l. Seed.

pair, subequal, subopposite, lance-linear, 1.5–2 cm long, conduplicate, erect, the bases with broad, pale, scarious borders, the medial zone thick, convex, mostly 3-ribbed, the costae convergent above to a prominent, cusplike, thickened, linear, often triangular apex, this ending in an eccentric-subulate-spinulose tip or a bristle-mucro; spikes pale green, broadly turbinate, 1–1.5 cm long, 1(–3)-flowered; spike bracts all fertile, longer than the sepals, loosely spirally set, the lowest slightly longer, 9–14 mm long, oblong-lanceiform, all navicular, with thickened, convex, pale green, low-nerved medial areas and at base broadly pale-scarious-bordered, toward apex convergent to a thickened-linear, trigonous, apiculate to short-spinulose tip; inner sepal usually lacking, if present oblanceolate, ecarinate, apically narrowly rounded and scarious, shorter than the laterals; lateral sepals subequal, lanceiform and navicular, 7–9 mm long, curvate-keeled, scarious and pale except along the thickened, entire keel; corolla 15–17 mm long, near white (cream), the spreading lobes broadly ovate, apically rounded, entire; staminodia apparently lacking; anthers lance-oblong, ca. 2 mm long, shorter than the filaments, the connective widest at base, apiculate at apex; style 8–10 mm long, the base triquetrous, producing 3 reflexed appendages at ca. 3 mm above base, the laterals narrowly claviform, the median one filamentous or very narrowly clavate. Capsule ellipsoid-cylindric, ca. 5 mm long, the valves thickened, particularly at apex, there slightly emarginate, sparsely tuberculate-papillose. Seeds wedge-shaped or eccentrically oblong, 6–9 mm long, longitudinally irregularly-and-sinuously-ribbed, some ribs narrowly hyaline-alate, the ribs connected transversely by many low, indistinct, rounded ridges.

Distribution. Infrequent at low elevations (100–150 m), white sand savanna, Territorio Federal Amazonas, Venezuela, west to southeastern Colombia (Amazonas, Vaupés).

Additional specimens examined. COLOMBIA. VAUPÉS: 1 km W Cacagual, *Maguire et al.* 36288 (NY, US); Cacagual Savanna, Río Atabapo, *Maguire et al.* 42435 (GH, K, US); Río Paraná-Pichuna, *Schultes & Cabrera* 19966 (GH, US); Mitu, *Zarucchi* 1354 (GH, US). VENEZUELA. TERRITORIO FEDERAL AMAZONAS: cerro Yapacana-caño Yagua, *Huber* 2518 (NY); sabanas de Curital, *Huber et al.* 3677 (NY); Río Guayapo, *Huber* 3838 (MYF, NY, VDB); sabana NE Caño Canamé, *Huber* 4050 (NY); SE Cerro Cucurito, *Huber* 6236 (MYF, NY, VDB); Cacagual savanna, Río Atabapo, *Maguire et al.* 42435 (F, NY); Sabana Canamé, Caño Canamé, *Wurdack & Adderley* 42851 (GH, NY). BOLIVAR: 3 km SW Peraytepuí, *Huber & Alarcon* 9689 (NY).

15b. *Abolboda acicularis* var. *granularis*

Maguire, Mem. New York Bot. Gard. 10: 18. TYPE: Venezuela. Territorio Federal Amazonas: Sabana Venado, left banks Caño Pimichín above Puerto Pimichín, Río Guainia, above Puerto Pimichín, 140 m, 23 Nov. 1953, *Maguire, Wurdack & Bunting* 36341 (holotype, NY; isotype, US). Figure 18.

Low, stiff, rosulate, short-lived perennial, the stems short, tufted, the roots spongy-thickened. Leaves fairly uniform, erect to ascending or (commonly) spreading-recurved, the principal ones (excluding juvenile or new shoots) 1–3(–5) cm long, tapering from broadened, spongy-dilated, 5-nerved clasping bases, gradually to fairly abruptly tapering into linear, thickened blades, these pale green or olivaceous, variously papillate or low-tuberculate, their tips eccentrically acute-mucronate or mucronulate, the adaxial side lingulate to level or slightly convex, thickened toward margin, the abaxial side with a strongly raised median costa and thickened borders, in cross section subtriquetrous, the angles rounded. Scapes stiff, terete, low-fluted, papillate to nearly smooth, 3–12 cm high, sheathed at base by 2–3, lance-linear, scarious-bordered, strongly carinate-costate basal bracts to 1 cm long, their tips subulate; scape bracts 1 pair (rarely lacking), subequal, lance-linear, 5–13 mm long, erect, costate and tipped as in basal bracts, located $\frac{1}{3}$ – $\frac{2}{3}$ the scape length from the base; spikes solitary or 2, the lower one on a narrowly ascending branch 1.5–3 cm long from the axil of a scape bract, all spikes turbinate, to 1 cm long, 2–4-flowered, the uppermost flower usually reduced; bracts lanceolate, the lowest slightly longer, ca. 1 cm long, all conduplicate, clasping-based, scarious-bordered, with thickened, pale green, convex, indistinctly 5-nerved dorsal areas, and narrowed above to a thickened, subtriquetrous, cuspidate tip as in leaves; sepals 2, rarely 3, the inner (if present) shortest, oblanceolate, ecarinate, to 5 mm long, distally scarious, rounded, the laterals unequal, 6–7 mm long, lanceolate, navicular, sharply acute, scarious except for the thickened, strong, pale green, smooth, keeled midzone; corolla white or near white, ca. 15 mm long, the spreading lobes broadly ovate, rounded, staminodia none or 1, arising low in the corolla tube, narrowly filiform with a clavate, incurved apex; anthers ca. 1 mm long, the oblong thecae divaricate at base by dilated connective, the filaments ca. 1 mm long; style base triquetrous-alate, the appendages arising at its base, erect, clavate, ca. 1 mm long, the lateral one reduced, short-linear, the stylar apex infundibular and la-

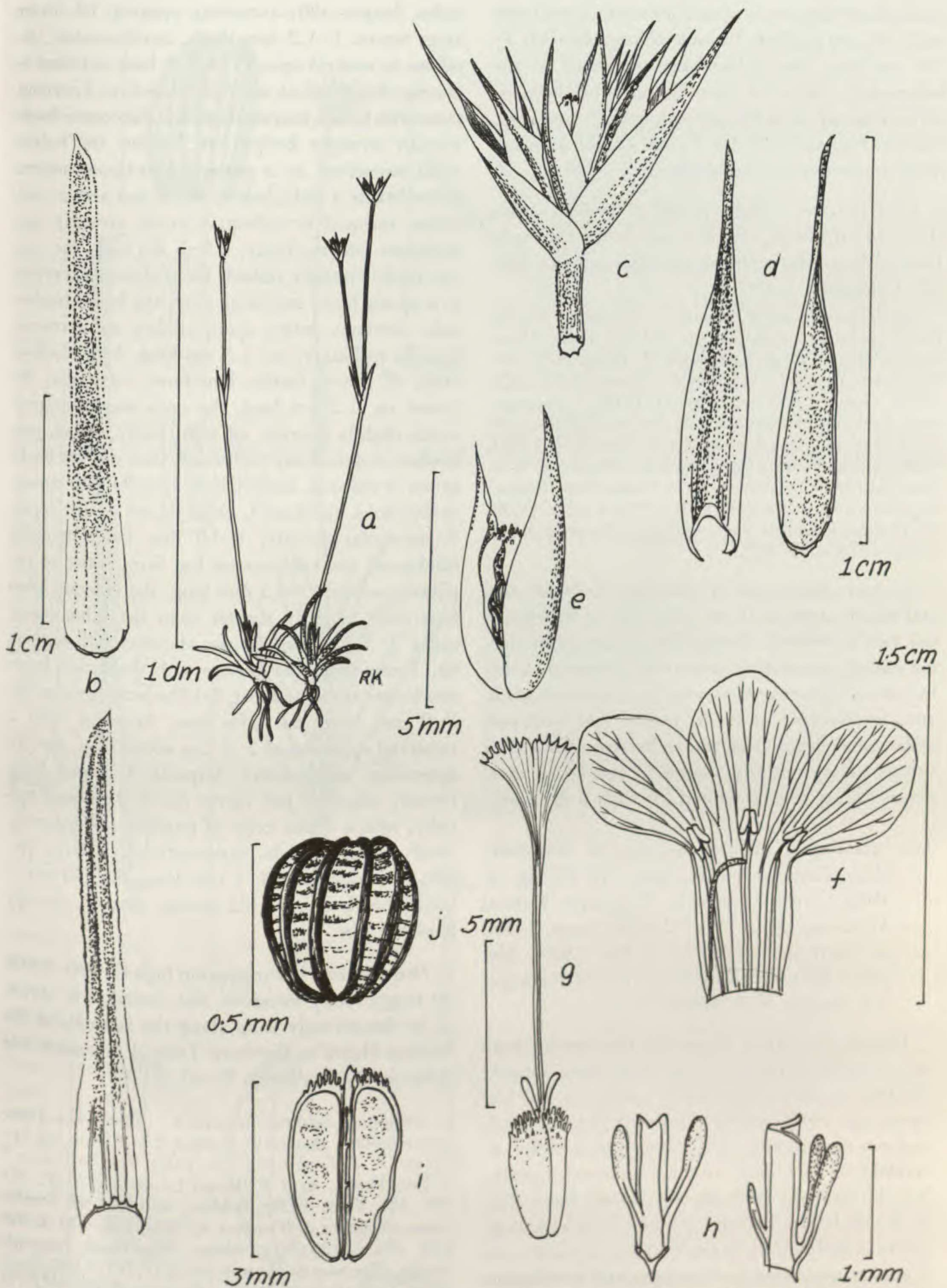


FIGURE 18. *Abolboda acicularis* var. *granularis* (Steyermark, Berry & Delascio 130352; Wurdack & Adderley 43295).—a. Habit.—b. Adaxial view of leaf (above), abaxial view of leaf (below).—c. Spike.—d. Abaxial view (left) and adaxial view (right) of spike bract.—e. Lateral sepals and capsule.—f. Spread corolla, stamens.—g. Gynoecium.—h. Two views of stylar base.—i. Capsule opened so as to show inner view of columella, septa of 2 locules.—j. Seed.

ciniate-fimbriate; ovary apex thickened, crested with tubercles and papillae. Capsule oblong-obovoid, 3–3.5 mm long, the valves very thickened at the tuberculate, incurved tips. Seeds subglobose or asymmetrically broadly obovoid, ca. 0.5 mm long, coarsely longitudinally 10–11-ribbed, the intervals finely transversely corrugated.

Distribution. Infrequent in low-elevation (100–400 m) white sand savanna, from Territorio Federal Amazonas in Venezuela westward into Vaupés, Colombia.

Additional specimens examined. COLOMBIA. VAUPÉS: Puerto Inirida, *García-Barriga* 20.824 (US); Araracuara, *Maguire & A. Fernandez* P. 44126 (GH, NY, US); Cerro Yapoboda, *Schultes & Cabrera* 14381 (NY, US); Araracuara, *Duivenvoorden* 213 (VDB). VENEZUELA. TERRITORIO FEDERAL AMAZONAS: Santa Cruz, *Foldats* 3685 (NY); Chapezon, laja, *Liesner & Carnevali* 22923 (MO, VDB); Sabana Venado, Caño Pimichín, *Maguire & Wurdack* 35594 (NY, US); N Cerro Vinilla SSW Ocamo, *Steyermark et al.* 130352 (VDB, VEN), 130369 (VDB, VEN); Sabana Venado, Caño Pimichín, *Wurdack & Adlerley* 43295 (NY, US).

Several differences in character between this and variety *acicularis* can tempt one to distinguish the two as species. Among these characters are, for variety *granularis*, a coarser indument, a different leaf apex, a tendency for the scape to branch, and development of erect, rather than reflexed, stilar appendages from the style base rather than upstyle. However, my studies of the floral characters are as yet too limited for such a decision.

16. *Abolboda ciliata* Maguire & Wurdack, Mem. New York Bot. Gard. 10: 17, fig. 2. 1958. TYPE: Venezuela. Territorio Federal Amazonas: 5 km W of Cumbre camp, 1,900 m, Cerro de la Neblina, 6 Jan. 1954, *Maguire, Wurdack & Bunting* 37132 (holotype, NY; isotype, US). Figure 19.

Densely caespitose perennial, the rosettes from ascending branches to 9 cm long, these densely cloaked by imbricate, chaffy spirals of old leaf bases, the roots spongy-thickened. Leaves fairly uniform in a rosette, the principal ones stiffly ascending to spreading, usually recurved apically, 2.5–10 cm long, their dilated clasping bases thin, to 8 mm broad, broadly scarious-bordered, long-ciliate or fimbriate-lacerate, the backs medially with 7 nerves, narrowing 2–3 cm from base to elongate-linear, stiff blades, these with convex, strongly nerved abaxial surfaces and involute, distantly scabrid or ascending ciliate margins, thickest toward apex, often in cross section triangular or lunate, the tips blunt with 1(–2) eccentric, short, stiff spi-

nules. Scares stiffly ascending or erect, 19–55 cm long, terete, 1–1.3 mm thick, multicostulate, papillose to scabrid apically and at base enfolded by oblong-elliptic, erect, imbricate bracts to 3 cm long, these with broad, scarious borders, the convex backs apically strongly keeled and costate, the central costa excurrent as a green, blunt-tipped mucro; scape bracts 1 pair, below, at, or just above, mid-scape, unequal or subequal, erect, strongly conduplicate, oblong-linear, 3.5–5 cm long, the convex backs strongly ribbed, the midcosta excurrent as a strong blunt mucro or cusp, the broad borders pale, scarious, entire; spike solitary and terminal, broadly turbinate, ca. 1.5 cm long, 4–5(–6)-flowered, all bracts fertile, lanciform, navicular, the lowest ca. 1.5 cm long, the ones above progressively slightly shorter, all with chaffy, broad, pale borders and medially thickened, their convex backs green or maroon, multiribbed, apically with strong, scaberulous, thickened, blunt-tipped cusps; sepals 2, navicular-curved, 8–10 mm long, medially thickened, the keel narrow but firm, entire or papillate; corolla 12–13 mm long, the obovate lobes blue-violet, slightly shorter than the tube; staminodia 2–3, filiform-clavate; stamens with anthers ca. 1 mm long, the thecae with divaricate bases and longer than the short, flat filaments; gynoecium 8–9 mm long, the style base flattened, with 2 recurved appendages 2–3 mm above base, the 3rd appendage not evident. Capsule 4–5 mm long, broadly ellipsoid, the valves much thickened apically, with a dense crest of papillae and tubercle. Seeds few per locule, asymmetrically short-cylindrical or wedge-shaped, 1 mm long, dark brown to nearly black with 20–22 strong, narrow, strongly papillate ribs.

Distribution. Frequent in high (1,900–2,200 m) boggy-rocky meadows and clearings in shrub, so far known only from along the summits of the Neblina Massif in Territorio Federal Amazonas and (presumably) bordering Brazil.

Additional material examined. VENEZUELA. TERRITORIO FEDERAL AMAZONAS: Neblina 2.5–3.5 km NE Pico Phelps, *V. A. Funk* 6261 (US, VDB); Vale de Titirico N of Pico Phelps, *Kral & Brewer-Carias* 71916 (F, MO, NY, US, VDB, VEN); Neblina, 4–6 km NE Cumbre Camp, *Maguire & Wurdack* 42145 (F, K, NY), 42390 (NY, US), 42420 (NY); Neblina, ridge, Brazil–Venezuela border, *Plowman & Thomas* 13592 (F, NY, VDB); Headwaters Canón Grande, Neblina, *Steyermark* 104017 (NY); Neblina, *Steyermark & Luteyn* 129826 (MO, VDB, VEN).

This distinctive species may occur with *Abolboda neblinae* or *A. paniculata*, but its morphological affinities are with taxa of lower elevations,

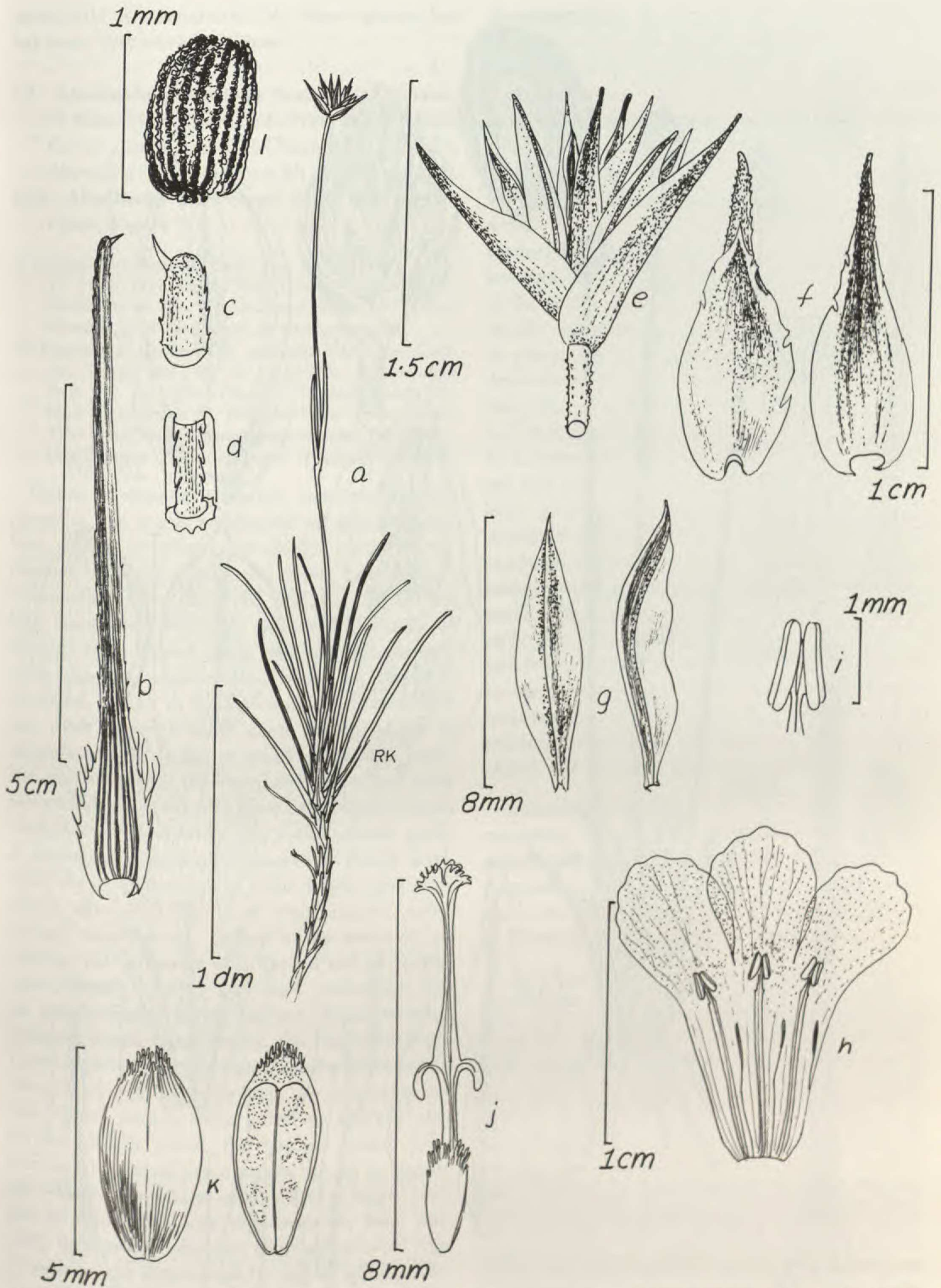


FIGURE 19. *Abolboda ciliata* (Steyermark & Luteyn 129826; Kral 71926).—a. Habit.—b. Leaf, abaxial side.—c. Leaf tip.—d. Leaf blade, sector at midblade, adaxial side.—e. Spike.—f. Fertile bract, midspike.—g. Lateral sepals, abaxial view (left), side view (right).—h. Spread corolla with stamens, staminodes.—i. Stamen.—j. Gynoecium.—k. Capsule (left); adaxial view of capsule valve (right).—l. Seed.

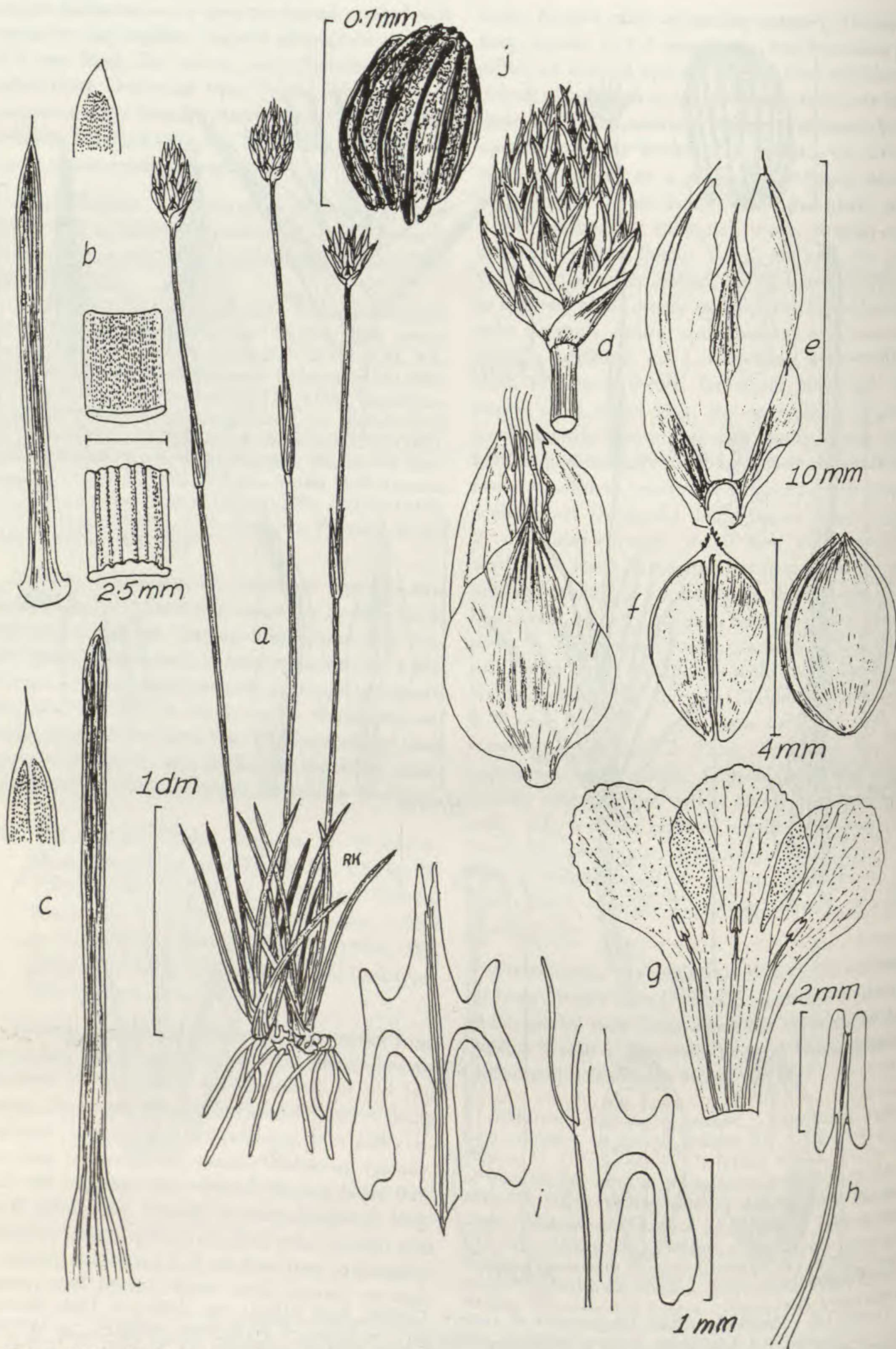


FIGURE 20. *Abolboda poarchon* var. *poarchon* (Hatschbach 40099).—a. Habit.—b. Leaf, abaxial side (left), apex (top); adaxial surface at midblade (middle), abaxial surface at midblade (below).—c. Leaf, abaxial apex (left); abaxial view of blade (right).—d. Spike.—e. Lateral sepals, inner view, showing fertile bract in background (above);

particularly *A. ebracteata*. No other species has leaf bases that are long-ciliate.

17. **Abolboda poarchon** Seub. in C. Martius, Fl. Bras. 3(1): 223. 1871. TYPE: Brazil. Minas Gerais: campis ascensus Chapada do Paranan, Martius 1728 (lectotype, M; phototype, NY).

17a. **Abolboda poarchon** Seub. var. **poarchon**. Figure 20.

A. chapadensis Hoehne, Com. Lin. Telegr., Bot., pt. 5: 11. 1915. TYPE: Brazil. Mato Grosso: Campo umido, cabeceiras do Rio Taquara-ussu, Mar. 1911, com Rondon 3597 (lectotype, R; phototype, US).

A. chapadensis Hoehne var. *pauciflora* Hoehne, Com. Lin. Telegr. Bot., pt. 5: 12. 1915. *A. poarchon* Seub. var. *pauciflora* (Hoehne) Hoehne, Indice Bibliogr. e Numerico Pl. Colhidas Com. Rodon: 144. 1951. TYPE: Brazil. Mato Grosso: Coxim, June 1911, com Rondon 3595 (lectotype, R; phototype, US).

Coarse to slender, glabrous, stout-rhizomatous perennial, the stems contracted or short-caudiciform, solitary or tufted on or along a coarse knotty rhizome, the roots spongy-thickened. Leaves erect to ascending, often excurved, stiff, (6-)10-25 cm long, compressed but firm, narrowed gradually or abruptly from dilated, pale, clasping and strongly convex-backed, multicostate bases to variously elongated, linear to linear-triangular blades 2-4 mm wide, these abruptly acute to acuminate to subulate-aristate at tip, at midblade usually linguulate, with incrassate, thickened-rounded edges, these pale and wirelike (actually from a thickened margin strongly curved inward), the surfaces rich green or anthocyanic, adaxially concave or rarely level, relatively smooth except at scabridulous apex marginally, abaxially slightly to very convex, often coarsely multinerved. Scapes stiffly erect to ascending, pale green or with tints of red or purple, terete, distally 1.5-2.1 mm thick, sometimes striate longitudinally, rarely sulcate, from scarious-bordered, erect, basal bracts, the scape bracts in 1 pair, slightly to very unequal, conduplicate, erect, oblong-linear, (2-)3-5 cm long, the convex medial zone ribbed, mostly deep green or marked with purple, apically acute, the borders broad, pale, scarious, the midrib excurrent as a cusp or mucro, also sometimes aristate; spike solitary, highly variable in shape, size, and pigmentation, from narrowly turbinate to obovate, ellipsoid or ovoid (this to some extent determined by age of spike), 1.5-3 cm long, the flowers several to many, all but the

lowest (or even this) fertile, the lowermost bracts broadly ovate and usually slightly longer, 9-13 mm, the apex acuminate-aristate, the borders broad, scarious, pale or marked with purple bands, the medial zone strongly thickened, dark green or green and purple, coarsely few-costate, the central costa usually broadest and pale; sepals 2, viewed from side elliptic-oblong, incurved, conspicuously exerted, 10-16 mm long, with broad, pale, scarious borders, the medial area thickened, the keel thin but firm, pale-cartilaginous, broad, short-spinulose at the retuse sepal tip, the sepal sides at keel base usually longitudinally banded with brown, purple, or green, the keel itself mostly papillate-ciliate or denticulate at least distally; corolla 14-16 mm long, blue or violet-blue, the broadly obovate lobes 5.5-6.5 mm long; staminodia not evident; anthers 2-2.5 mm long, narrowly oblong, deeply emarginate and sagittate, on slender filaments to 5 mm long; gynoecium nearly as long as corolla, the slender style base deeply triquetrous, with 3 appendages, the laterals reflexed, clavate, basally with acute or oblong auricles, the median appendage usually filamentous and suberect. Capsule valves uniformly firm, the body broadly ellipsoid, ca. 4 mm long, the slightly thickened valve tips short-acuminate, papillate; seeds ovoid to ellipsoid or subprismatic, 0.7-0.8 mm long, dark brown to nearly black, coarsely and irregularly longitudinally ribbed, the intervals broad and nearly smooth.

Distribution. Moist to wet rocky campos, campinas, savannas and savanna bogs, edges of gallery forest and stream banks, 400-1,300 m, Amazonian and planaltan Brazil, from Amazonas, Para, and Mato Grosso south through the planalto to Minas Gerais; Paraguay; Surinam(?).

Additional specimens examined. BRAZIL. AMAZONAS: Transamazon Hwy., 9 km W Rio dos Pombos, Calderon et al. 2548 (INPA, NY, US, VDB); Transamazonica km 350 e 400, E Humaita, Cid Ferreira 5897 (INPA, NY, VDB). BAHIA: Rio Piau 150 km SW Barreiras, Irwin et al. 14740 (F, GH, MO, NY, US). DISTRITO FEDERAL: Chapada da Contagem, Irwin & Soderstrom 5236 (F, NY), ca. 1.5 km W antenas de Radiobrasil, Kirkbride 4734 (VDB). GOIAS: ca. 15 km N Curumba de Goias, W. R. Anderson 10443 (F, K, MO, NY, US); W. Gardner 3486 (F, GH, K, NY); Serra dos Pyreneos, Glaziou 22233 (F, K, MO); Pinanhas, Hatschbach 40099 (MO, NY, US, VDB); 30 km N Veadeiros, Irwin et al. 24507 (NY); ca. 20 km N Veadeiros, Irwin et al. 12627 (F, GH, K, MO, NY)—this set a mix with *A. pulchella*; 30 km N Veadeiros, Irwin et al. 24507 (NY); 20 km N Alto

do Paraíso, *Irwin et al.* 32126 (F, NY, US); 12–20 km N Alto Paraíso, *King & Bishop* 8837 (US—extremely puzzling material consisting of 2 plants, the taller with no scape bracts on one of the two scapes, the other a lower plant with one bractless scape, but with a pair directly subtending spike); Jataí to Milho Verde, *Kral & Wanderley* 75004 (SP, VDB); 5 km N Alto Paraíso, *Kral & Wanderley* 75856 (SP, VDB); Pirineus, *Macedo* 3700 (MO, NY, US). MATO GROSSO: 6 km S Xavantina, *Argent et al.* 6450 (U); San Antonio de Levenger, *Hatschbach et al.* 36096 (US, VDB); Xavantina–Cachimbo Road, *Hunt & Ramos* 5663 (K, NY, VDB); 84 km N Xavantina, *Irwin et al.* 16400 (F, GH, MO, NY, VDB); 23 km S Agua Boa, *Kral & Wanderley* 75213 (SP, VDB); 6 km S Xavantina, *Richards* R677 (U); Xavantina–São Felix Rd., *de Santos et al.* 1693 (NY, U). MINAS GERAIS: Cachoeira do Campo, *Glaziou* 20520 (F); 27 km SW Diamantina, *Irwin et al.* 21947 (F, GH, MO, US); Cerro do Cabral, *Kral & Wanderley et al.* 72639, *Wanderley & Kral et al.* 790 (SP, VDB); 5–7 km N Grão Mogul, *Kral & Wanderley* 75434 (SP, VDB); Boa Vista to Extracção, *Melo-barreto* 9657 (F); Serra do Espinhaço, *Hatschbach & Pelanda* 27764 (VDB); Joaquim Felecio, Serra do Cabral, *Stannard et al.* SPF 35902, CFCR 6297 (CFCR, K, SPF, VDB). PARA: Serra do Cachimbo, *Alvarenga, Jardim Bot. do Rio de Janeiro* 90.585 (US); Ariramba, *Black et al.* 57-19611 (NY); campo Piranema, *P. S. Goeldi, Herb. Mus. Paraensis* 15061 (US); Obidos, Jaramacarú R, *Egler* 277 (US); Serra do Cachimbo, *Pires et al.* 6185 (NY). PARAGUAY. Cerro Torin–Sierra de Amambay, *T. Rojini* 4066 (GH). SURINAM. (?) “Surinam, coll. *Focke*” (MO—a depauperate, possibly mislabeled, specimen).

Abolboda poarchon var. *poarchon*, by far the most abundant and wide-ranging of the two varieties treated here, is also the most highly variable. Typically, it forms large clumps or clones by means of branching rhizomes. The plants of grassy wet campos usually have more erect, elongate-linear leaves and scapes reaching nearly to a meter; those of more exposed sites or at higher elevations are lower with shorter leaves that are more spreading and also frequently setaceous-tipped. Additionally, the plants of high elevations and of more exposed sites have much more anthocyanin. This is produced in large quantity on the dorsal areas of sepals and bracts, making the inflorescence quite handsome. It flowers later in the day than does either its other variety or *A. pulchella*, with which it frequently associates.

17b. *Abolboda poarchon* Seub. var. *intermedia* (Lyman B. Smith & Downs) Kral, comb. nov. *A. pulchella* Humb. & Bonpl. var. *intermedia* Lyman B. Smith & Downs, *Arq. Bot. Estado São Paulo, nov. ser., Vol. 4, fasc. 2: 26. 1966.* TYPE: Brazil. Minas Gerais: Carandai–Brejão, 28 Nov. 1946, *A. P. Duarte* 682 (holotype, US; isotype, RB). Figure 21.

Strongly clonal, glabrous perennial, the rosettes from slender, spreading or ascending rhizomes and forming a localized “turf,” the roots coarse, the rhizomes more slender than in the type variety. Leaves of new rhizomes and shoots scalelike, spiral, variously triangular, 5–15 mm long, subulate-tipped, grading upstem to progressively narrower and more close-set ones of the principal rosette, these ascending to spreading or recurved, 20–60(–70) mm long, the sheaths broadly clasping, pale, thin, except for the ca. 5 raised costae, narrowing abruptly to linear or linear-triangular blades, these mostly 2–3 mm wide, firm, slightly lingulate (rarely plane), broadly or narrowly acute, the margin thick, entire or rarely with a few denticles or tubercles apically, green to greenish brown or maroon, the adaxial surface level or slightly concave, not evidently nerved, the abaxial surface convex, faintly to conspicuously broadly raised-nerved. Scapes usually 1 per rosette, erect, stiff, 15–40(–50) cm high, slightly compressed to variously few-costate or bluntly angulate, ca. 1(–1.5) mm broad or thick, medially with 1 pair of erect, conduplicate, equal or unequal scape bracts 2–3 cm long, these convex-backed with broad, green, low-costate medial areas, broad, pale, scarious, entire borders, and subulate-aristate tips; spikes solitary, mostly narrowly ovoid, aging narrowly turbinate or ellipsoid, 1.5–2 cm long, (2–)4(–7)-flowered, often at tip with 1–2 sterile florets; spike bracts all fertile or the lowermost empty, in any case ovate, ca. 9 mm long, those upspike slightly longer, to 10.5 mm long, all with broad green to maroon multicostulate convex backs with broad, thin borders and short-acuminate, then aristate, tips; sepals 2(–3), the laterals lanciform, subequal, navicular, 11–12 mm long, the curvate medial zone with a strong entire keel, this comprising the narrowly acuminate apex, the inner sepal when present thinner, lanciform but less keeled, ca. 9 mm long; corolla deep bright blue, 18–20 mm long, the lobes broadly ovate, ca. 10 mm long, erose-margined; staminodia not evident; anthers oblong, yellowish or pale, ca. 2–2.5 mm long, deeply emarginate and sagittate, the slender, flattened filaments attached 3–3.5 mm below corolla sinus; gynoecium ca. 14–15 mm long, the slender style 11–12 mm long, the 3 appendages set 1.5 mm or more above ovary summit, reflexed, the laterals claviform, ca. 1.5 mm long, the median one filamentous, longer, the stigma infundibular, lacero-fimbriate, bright blue-violet. Capsule ovoid, ca. 4 mm long, the thickened valves smooth, broadly acute at tip. Seeds irregularly ovoid to subprismatic or turbinate, deep brown to nearly black, 0.6–0.7 mm long, sculpted as in the type variety.

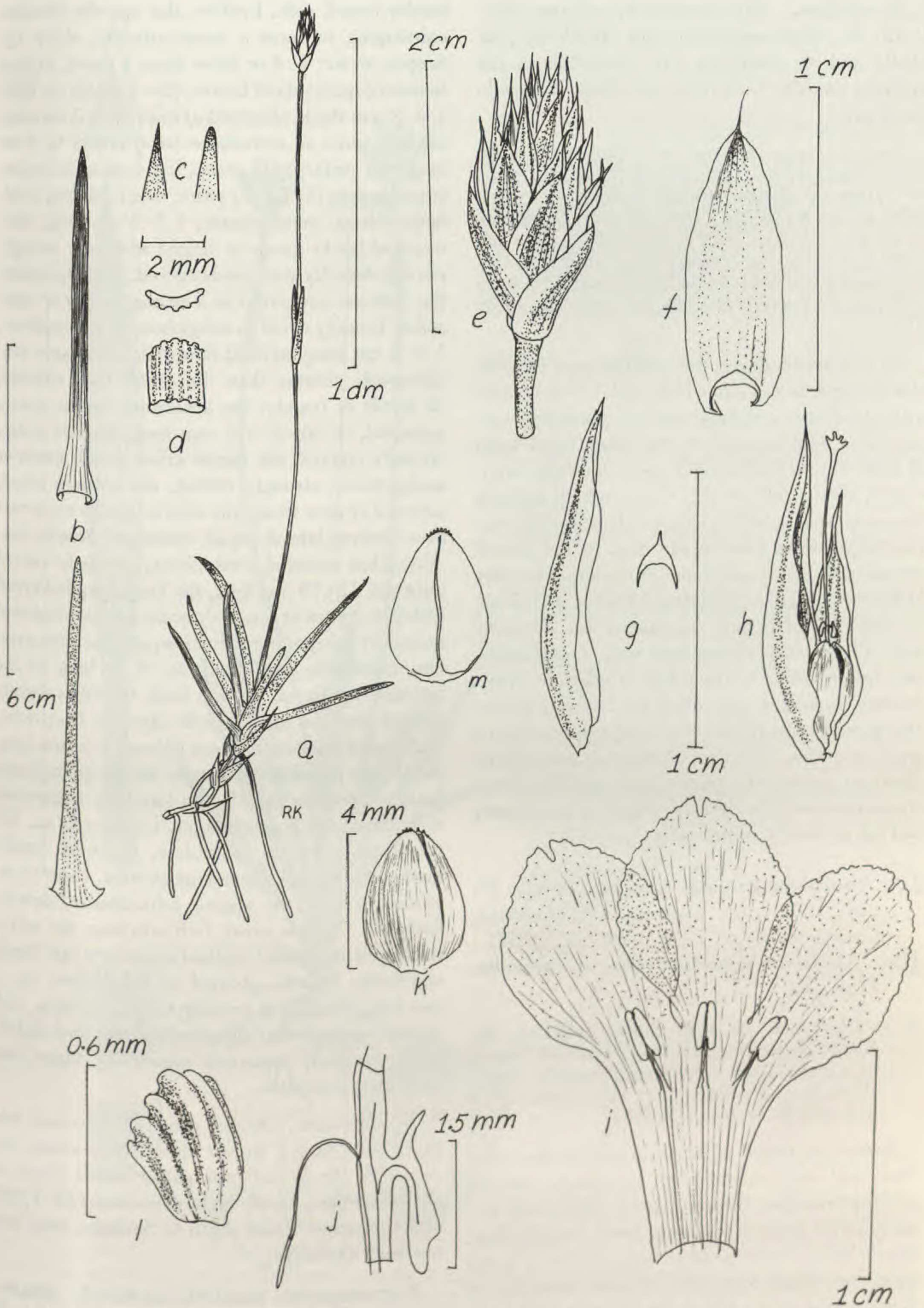


FIGURE 21. *Abolboda poarchon* var. *intermedia* (Kral & Wanderley with E. Lima 75300).—a. Habit.—b. Abaxial (top) and adaxial (below) views of leaf.—c. Two leaf tips.—d. Sector of midblade, abaxial side (below); cross section (above).—e. Spike in fruit.—f. Lower spike bract.—g. Lateral sepal, side view.—h. Lateral sepal, inner sepal, and gynoecium.—i. Spread corolla with stamens.—j. Style base showing one lateral appendage and the third appendage.—k. Capsule.—l. Seed.

Distribution. Wet, often rocky, campos, 400–1,200 m, often associated with *Abolboda pulchella* and *A. poarchon* var. *poarchon* in the Brazilian planalto from Goiás and Minas Gerais to São Paulo.

Additional material examined. BRAZIL. GOIAS: 30 km W of Jataí, 21 Sep. 1988, Kral & Wanderley 75005 (SP, VDB); by BR 050, 10 km S Cristalina, 12 Oct. 1988, Kral & Wanderley 75300 (SP, VDB); by BR 050, 92 km S of Cristalina, Kral & Wanderley 75340 (SP, VDB); Jataí to Goiania, Maguire et al. 57001 (NY, US). MINAS GERAIS: Carandaí-Brejão, Duarte 682 (US); Serra do Espinhaço, Gouveia, Hatschbach & Pelanda 27764 (US).

As mentioned above, this plant is most remarkable in the field and almost invariably is associated with *Abolboda pulchella* and *A. poarchon* var. *poarchon*. One is struck by the finer, lower habit of both *A. pulchella* and *A. poarchon* var. *intermedia*, and by the fact that they are both morning bloomers while nearby plants of *A. poarchon* var. *poarchon* bloom later in the day. In the overall perspective, in leaf character, in the larger number of flowers, in stilar appendages, bracts, and seeds, the affinities of variety *intermedia* are distinctly with *A. poarchon* rather than with *A. pulchella*, thus necessitating a varietal-level transfer. Interestingly, typical *A. poarchon* has leaf tips noticeably serrulate-denticular or papillate, and its lateral sepals are often either tuberculate or tuberculate-ciliate to denticulate, particularly apically. These characters are either less-developed or are entirely lacking in variety *intermedia*.

18. *Abolboda grandis* Griseb., *Linnaea* 21: 281. 1848. TYPE: Surinam. Joden-Savanna, Cordonpad, Kegel 1131 (holotype, GOET).

18a. *Abolboda grandis* Griseb. var. ***grandis***. Figure 22.

A. grandis Griseb. var. *minor* Spruce ex Malme, Bih. Kongl. Svenska Vetensk.-Akad. Handl. 26 (Afd. 3, no. 19): 14. 1901. TYPE: Brazil. Amazonas: "Prope Barra, Prov. Rio Negro," July 1851, Spruce 1654 (holotype, K; isotypes, BM, NY).

Solitary or tufted, glabrous perennial, the stems short and stout-caudiciform, sometimes with ascending branches, the roots spongy-thickened. Rosette leaves several to many, erect to spreading, mostly linear-lorate, 8–35 cm long, 8–15(–17) mm wide, the sheath base pale, clasping, lingulate, to 5 mm broad, upward strongly convex-backed and multicostate, variously narrowing, then dilating to the blade, this flat or lingulate (concave), mostly elliptic-linear or linear-oblongate, deep green, multinerved, the nerves more raised abaxially, the

border broad, pale, hyaline, this apically involute, converging to form a conic-subulate, sharp tip. Scapes terete, 1–4 or more from a shoot, axillary to inner (upper) shoot leaves, (20–)30–80 cm high, 1.2–2 mm thick, sheathed at base by 2–3 involute, oblong, acute to acuminate basal bracts to 3 cm long, the surface dull green, low-costate or striate; scape bracts (1–)2(–3) pairs, erect, oblong or elliptic-oblong, conduplicate, 1.5–3 cm long, their rounded backs green or tinged with red, strongly nerved, broadly scarious-bordered, their tips acute, the midzone excurrent as a strong mucro or cusp; spikes broadly ovoid to subglobose or hemispheric, 1.5–3 cm long, several-flowered, the bracts conspicuously shorter than the sepals they subtend, all fertile or (rarely) the lowermost sterile, nearly subequal, (5–)6–9(–10) mm long, broadly ovate, strongly convex, the dorsal areas broad, green or anthocyanic, strongly ribbed, the borders broad, pale red or near white, the midrib usually excurrent as a mucro; lateral sepals subequal, broadly lanceiform but rounded-conduplicate, strongly curved outward, 12–15 mm long, the keel sharp but broad and firm, entire or minutely scaberulous, excurrent as a short-sharp mucro; inner sepal sometimes present, ecarinate, spatulate, to ½ as long as the laterals; corolla ca. 20 mm long, the lobes slightly shorter than the tube, broadly obovate, blue-violet; staminodia lacking; anthers oblong, 2.5 mm long, the thecae parallel, the slender filaments ca. 3 mm long; gynoecium ca. 15 mm long, the triquetrous style base with 3 appendages, the laterals ca. 2.5 mm long, reflexed, spatulate, flattened distally inside, the central appendage shorter, erect or recurved, linear, the stigma infundibular, densely fimbriate. Capsule ovoid, 6–8 mm long, the valves thickened at the bifid-toothed acuminate tips. Seeds angulately broadly obovoid to subglobose, ca. 1 mm long, sometimes broader than long, dark, with several strong, wavy, longitudinal ribs and slightly lower, variously transverse connecting ridges, thus appearing reticulate.

Distribution. Acidic, usually arenaceous and peaty soils, in full sun or shade, of caatinga, savanna, or shrub, mostly in gallery forest edges, at low to medium, rarely high, elevations (25–1,900 m), Amazonian Brazil north to Surinam, west into southern Colombia.

Representative material examined. BRAZIL. AMAZONAS: Plato da serra Aracá, 18 Jan. 1984, I. L. do Amaral 1624 (K); Manaus–Caracaraí Rd., km 140, 27 Sep. 1973, Berg et al. P18166 (INPA, U, US); Manaus, C. Chagas INPA 1789 (US); Rio Uatuma, 13 Aug. 1979, Cid et al. 287 (F, INPA, NY, VDB); Igarapé das Lajes, 9 Aug. 1983, Cid 4286 (INPA, NY, VDB); Cachoeira

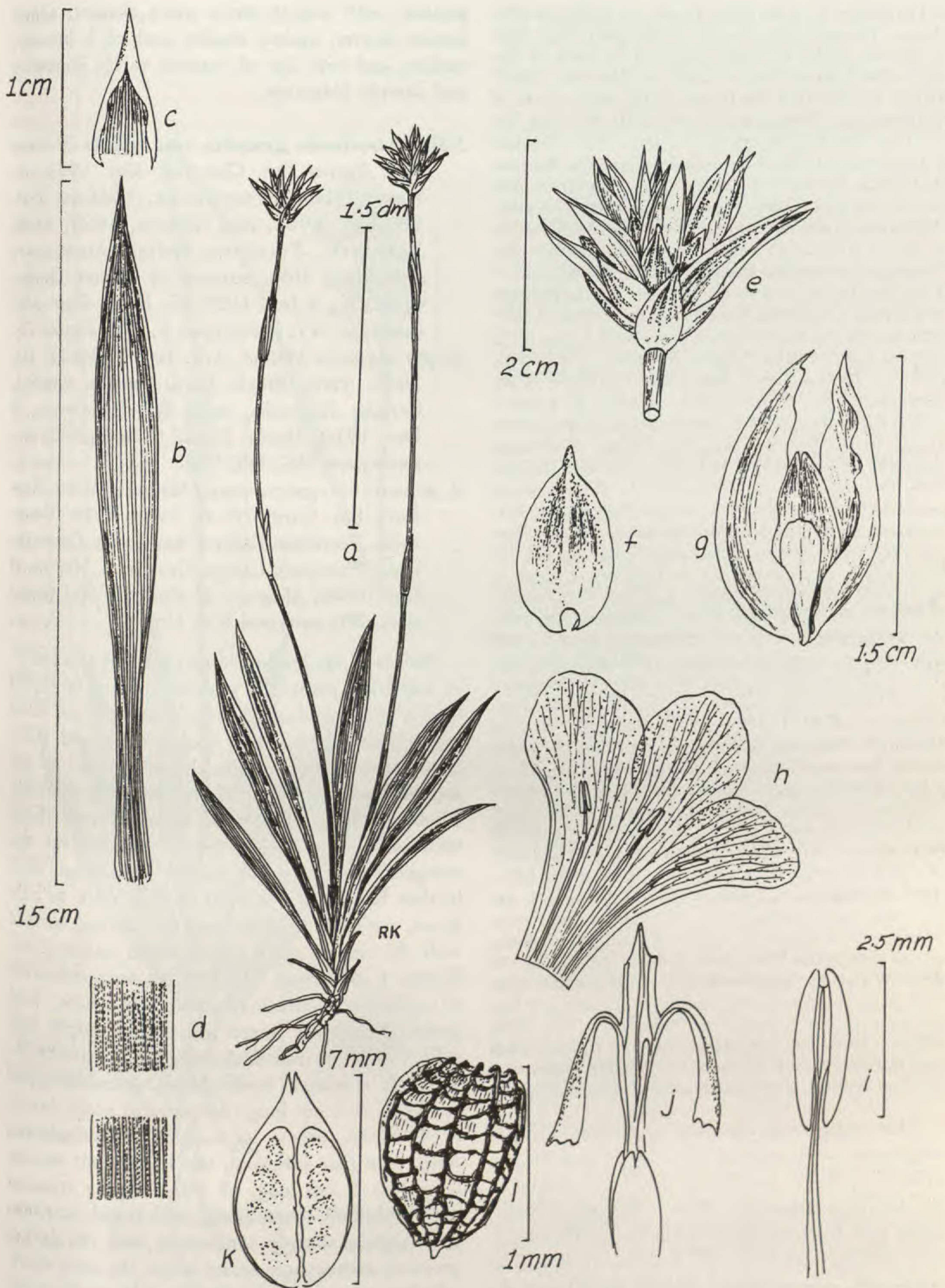


FIGURE 22. *Abolboda grandis* var. *grandis* (Clark 7018; Prance et al. 28883).—a. Habit.—b. Leaf.—c. Leaf tip.—d. Sector of midblade, adaxial side (above), abaxial side (below).—e. Spike.—f. Fertile bract.—g. Sepals and enclosed ripe capsule.—h. Spread corolla, stamens.—i. Stamen.—j. Styler base and appendages.—k. Capsule valve, inner view.—l. Seed.

do Passarinho, 13 June 1927, *Ducke s.n.* (US); km 130, Manaus–Caracaraí Rd., *Gentry 12947* (MO, NY); Falls of Tarumá, *Killip & Smith 30164* (US); Basin of Rio Negro–Rio Cuieras, *Prance, Coêlho & Monteiro 14822* (F, GH, K, NY, US); Rio Cuieras 2 km below mouth of Rio Brançinho, *Prance et al. 1791* (GH, MO, US); Rio Xie, Cachoeira Cumati, 29 Nov.–7 Dec. 1947, *Schultes & Lopez 9213* (NY); Wasserfall das Taurumu, Manãos, Mar. 1912, *Ule 8827* (K); Obidos, *Egler 433* (US); Alto Tapajos, 14 July, 1959, *Egler & Raimundo 89A* (MG, US). RORAIMA: 6 km ao S do equador na Br 174, *Cordeiro et al. 79* (INPA, NY, VDB). COLOMBIA. VAUPES: Río Piraparana, cuenca Río Apaporis, *Garcia-Barriga 14277* (US); Río Vaupés, Cerro de Circasia, *Garcia-Barriga 15038* (GH, US); Puerto Colombia, *Maguire et al. 41867* (US); Rio Xie, Cachoeira Cumati, *Schultes & Lopez 9213* (US); Cachivera Palaito, *Schultes & Cabrera 13179* (GH, US); San Filipe and vic., *Schultes et al. 18009* (GH); Cerro Kañenda, 10 Nov. 1952, *Schultes & Cabrera 18386* (GH); Raudal de Yuruparí, *Schultes & Cabrera 19722* (GH); Mitu and vic., Río Vaupés at Circasia, *Zarucchi 2046* (GH, K, MO, US). GUYANA. Canister Falls, Demerara Co., *Abraham 301* (K, NY); Kaieteur savanna, *Jenman 1020* (NY); Amatuk Falls, Potaro River, *Jenman 7480* (K, NY); Mt. Membaru, *Maas & Westra 4270* (NY). SURINAM. Sanderij, *Essed 111* (K, U); N of Berlijn, *Heyligers 102* (U); Tafelberg, *Kramer et al. 3256* (U); Zanderij I, airport, *Lanjouw & Lindeman 259* (NY, U); Coppenam River headwaters, *Maguire 24176* (F, GH, K, NY, U); “Surinam,” *Miquel 1850* (K); Tafelberg, Savanna I, *Maguire 24215* (F, GH, MO, NY, U, US). VENEZUELA. TERRITORIO FEDERAL AMAZONAS: base of Cerro Cucuy, *Baldwin 3233* (US); Yavita, *Bunting et al. 3745* (F); “Cabeza de Manteco,” “Raudal Manteco,” *Guanchez & Melgueiro 3433* (MYF, VDB); Macizo Aracamuni, *Huber & Medina 5912* (US, VEN); 9 km NE of San Carlos, *Liesner 3918* (MO, NY); Cerro Aracamuni, summit, *Liesner & Delascio 21955* (MO, VDB); Cerro Sipapo, 1,600 m, *Maguire & Politi 28206* (NY); sabanita E of Maroa, *Maguire & Wurdack 35687* (K, NY); Pimichin, *Maguire et al. 36382* (NY, US— noted by Maguire as a possible hybrid between *A. angustifolia* and *A. grandis*); 8–10 km N of San Carlos, 21 Apr. 1984, *Plowman 13704* (F); ad flum. Guainía, ostium flumenensis Casiquiare, *Spruce 3545* (GH); 30 km SSW Ocamo, *Steyermark et al. 130357* (MO). BOLIVAR: punta meridional del Auyan-tepui al Norte y el Uiapanteepui al Sur, *Huber et al. 9900* (MYF, NY, VDB, VEN—a borderline morphology with var. *rigida*); 3 km S of El Puaji, *Liesner & Holst 18798* (MO, VDB); 15.5 km E of Icabarú, *Steyermark et al. 117794* (NY).

This widespread variety is comparatively homogeneous over most of its range except for the area of northern Amazonian Brazil transitional to the Guayana Highlands. Here, in parts of Amazonas and Territorio Roraima in Brazil and contiguous Bolívar and Territorio Federal Amazonas in Venezuela, intermediates can be found that are very difficult to place because they grade into the typically highland *Abolboda grandis* var. *rigida*. A more detailed description of the problem is given below. Typically *A. grandis* var. *grandis* is a lower plant with leaves tending more to a linear-lorate

pattern, with scapes much more slender, scape bracts shorter, spikes smaller and of a broader outline, and with tips of capsule valves distinctly and sharply bidentate.

- 18b. *Abolboda grandis* var. *rigida*** Malme, *Bull. Torrey Bot. Club* 58: 326. 1931. *A. rigida* (Malme) Steyermark, *Fieldiana Bot.* 28: 105. 1951, non Gleason, 1929. TYPE: Venezuela. Territorio Federal Amazonas: Brocchinia Hills, summit of Mount Duida, 4,500 ft., 4 Jan. 1929, *G. H. H. Tate 586* (holotype, NY; phototypes, F, NY). Figure 23.
- A. pervaginata* Malme, *Ark. Bot.* 25A(12): 16. 1933. TYPE: Brazil. Pará: lugares umidos, Campos Ariramba, meio Rio Trombetas, 4 Dec. 1910, *Ducke 11352* (lectotype, S; isotypes, MG, RB, US).
- A. grandis* var. *guayanensis* Maguire, *Mem. New York Bot. Gard.* 10: 8. 1958. TYPE: Venezuela. Territorio Federal Amazonas: Cerro Sipapo (Paraque), Campo Grandé, 1,500 m, 8 Dec. 1948, *Maguire & Politi 27561* (holotype, NY; isotypes, NY, US).

Similar to *Abolboda grandis* but overall a coarser and taller plant, the rosettes solitary or tufted from a stout caudex, or often from stiff and stout crown branches, the roots spongy-thickened. Principal leaves fairly uniform, broadly linear to triangular-linear or lorate, stiffly spreading to erect, 15–60 cm long, 10–20 mm wide, tapering above midblade and involute to form a subulate tip, the margins with an entire, pale or violaceous, thin, hyaline border, the adaxial surface dark to pale green, narrowly multiveined, the abaxial surface with the nerves more raised, often anthocyanic. Scapes 1 to several, 50–110 cm long, subterete or sometimes sulcate-angulate, low-striate, pale green or variously tinged with red or purple, apically 1.5–3(–4) mm thick, invested at base by 2–3 erect, scarious, lance-oblong, subulate-tipped bracts to 3–4 cm long, the pairs of scape bracts (1–)2–3(–4), erect, lance-oblong, conduplicate, those of a pair subequal, the lowest pair usually largest, 3–5 cm long, all with strongly rounded backs, medially multicostate, with broad, scarious, pale borders sharply contrasting with the darker green or anthocyanic dorsal areas, the apex short-subulate or cuspidate; spikes mostly ovoid or cylindrical-ovoid, rarely obovoid, 1.8–4 cm long, the bracts and sepals as in the species but proportionally longer; bracts (6–)6.5–9 mm long, with green anthocyanic dorsal areas, the lateral sepals 1.2–2 cm long, the broad, curved keels often distantly

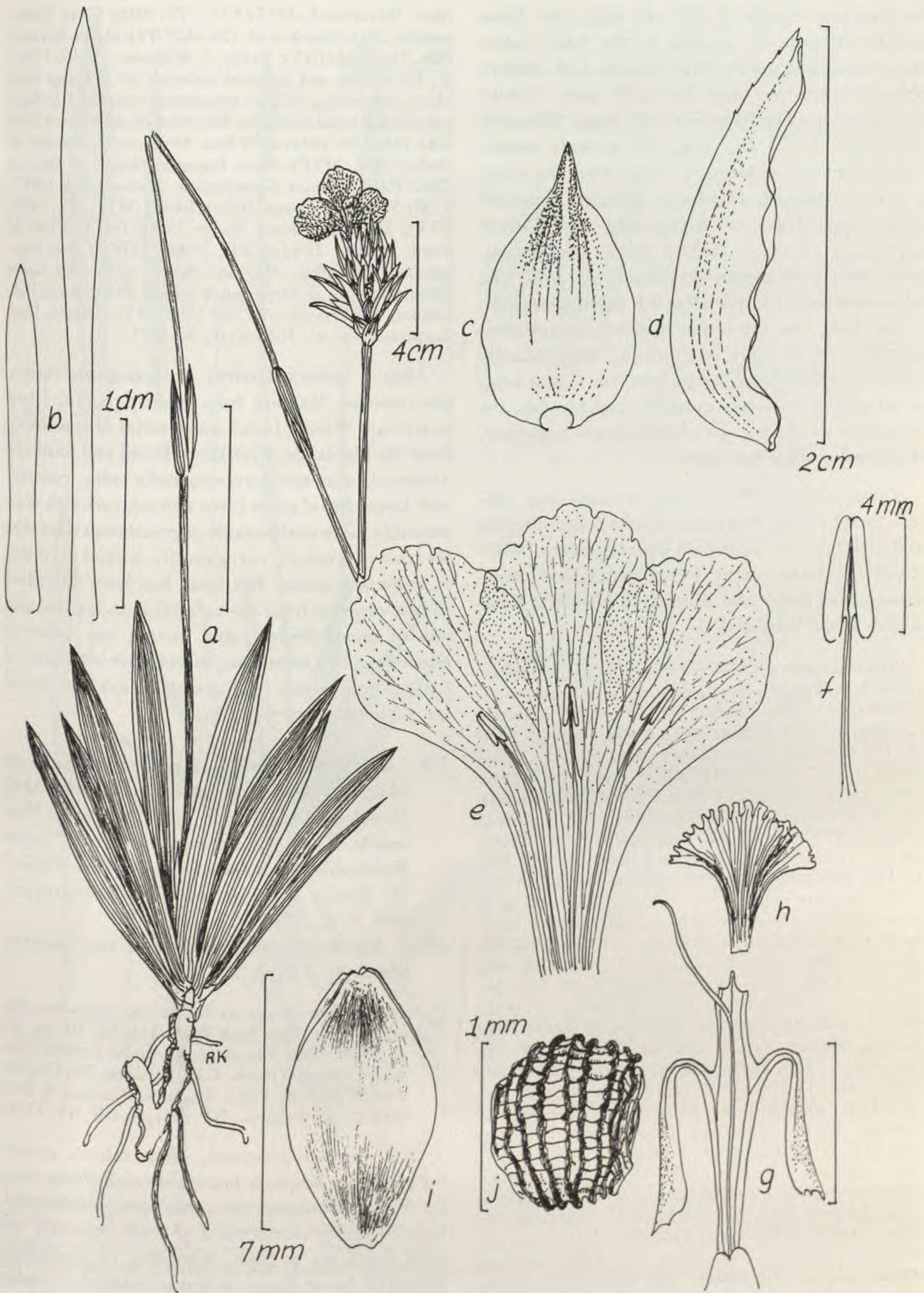


FIGURE 23. *Abolboda grandis* var. *rigida* (Maguire & Politi 27561; Tate 586).—a. Habit.—b. Two extremes of leaf outline.—c. Fertile bract.—d. Lateral sepal.—e. Spread corolla and stamens.—f. Stamen.—g. Style base and appendages.—h. Stylar apex and stigmas.—i. Capsule.—j. Seed.

low-lacerate; corolla 3–3.5 cm long, the lobes broadly obovate, ca. as long as the tube, violet-blue; staminodia not evident; stamens with anthers oblong, 4–4.5 mm long, the locule bases slightly divergent, the filaments 5–6 mm long, flattened; gynoecium 3–3.5 mm long, the strongly triquetrous style base producing 4–5 mm above the ovary a pair of reflexed, claviform, obliquely truncate lateral appendages ca. 4 mm long, the reduced appendage above or slightly below, filamentous, often erect, the stigma lobed-infundibular, with lobe edges fimbriate. Capsule ellipsoid, subtrigonous, 6–7 mm long, the valve tips shallowly round-lobed apically. Seeds dark red-brown, longitudinally coarsely ribbed as in the species, ca. 1 mm long, pyramidal or variously quadrate and faceted, the cross-ribs numerous and slightly lower and finer, thus seed surface reticulate.

Distribution. Wet, acidic savanna bog, gallery forest edges, rocky shrubby summits of tepuis and high bogs, at medium to high elevations (600–2,000 m), Surinam west to Territorio Federal Amazonas, Venezuela, and south into northern Amazonian Brazil (to Pará).

Representative specimens examined. BRAZIL. AMAZONAS: Serra Aracá, 12 Feb. 1984, *Prance et al.* 28988 (NY, VDB), 28883 (NY, US, VDB); Manaus-Caracari, km 130, 25 May 1974, *Rodrigues et al.* 9283 (F, INPA). PARA: região do Ariramba, 30 May 1957, *Black et al.* 57-19806 (IADN, NY); E of Faro, 27 Aug. 1907, *Ducke* 8530 (US); Obidos, *Egler* 433 (US). RORAIMA: Serra Parima S of Auraris, 10 Feb. 1969, *Prance et al.* 9816 (INPA, K, NY, US); summit Serra Parima, 30 July 1974, *Prance et al.* 21565 (INPA, K, MO, NY, U, US). COLOMBIA. AMAZONAS: opposite Maroa, 12 Oct. 1957, *Maguire et al.* 41867 (NY—material difficult to place with either variety). GUYANA. ATKINSON: St. Cuthbert's Trail, 12 Jan. 1969, *U. G. Bio.* 106 (NY); Kaieteur plateau, 7 Mar. 1962, *Cowan & Soderstrom* 1061 (K, NY, US); Kaieteur Savanna, *Jenman* 1019 (K, NY); Mt. Membaru, 12 Nov. 1979, *Maas & Westra* 4270 (K, NY, U, US); Mt. Aymatoi, *Maas et al.* 5681 (US); Kaieteur Plateau, *Maguire & Fanshawe* 23148 (F, GH, MO, NY, U, US); Partang Savanna, *Maguire & Tillett* 43817 (K, NY); Membaru Creek, *Pinkus* 223 (GH, MO, NY, US). SURINAM. prope Jodensavanne, *Heyligers & Knoppe* 3223 (U); Zanderij I, *Lanjouw & Lindeman* 259 (U); W of Zanderij I, *Lindeman* 6518 (F, GH); Lobin savanna, *Teunissen-LBB* 15180 (U). VENEZUELA. TERRITORIO FEDERAL AMAZONAS: between Yavita and Pimichín, *Bunting et al.* 3745 (K, NY, U, VDB); Serrania Parū, *Cowan & Wurdack* 31146 (NY, US), sector centro-norte, *Huber* 4335 (K, MYF, NY, VDB); plateau of Duida, *Liesner* 18161 (MO, VDB, VEN); Cerro Sipapo, *Maguire & Politi* 28702 (K, NY, US), middle east drainage, 28354 (NY); Cerro Duida, *Maguire et al.* 29623 (NY, U); summit Cerro Guanay, *Maguire* 31702 (NY); Cerro Guaiquinima, *Maguire* 32958 (US); 1 km E of Maroa, *Maguire & Wurdack* 36424 (F, NY, US); Duida, Brocchinia Hills, *Steyermark* 58181 (F, NY); Sierra Pa-

rima, *Steyermark* 107514 (F, NY, MO); Cerro Duida, cumbre, *Steyermark et al.* 126382 (NY); Duida, Savanna Hills, *Tate* 1041 (NY); Yavita, *L. Williams* 13910, 13951 (F, US—these and material collected by Williams from Maroa comprising difficult transitional morphs); Río Siapa just below Raudal Gallineta, *Wurdack & Adderley* 43539 (GH, NY, US). BOLIVAR: S base Auyan-tepui, *Davidse & Huber* (MO, MYF); hacia Icabaru, *Huber & Alarcon* 7892 (NY); Macizo Guaiquinima, *Huber* 9354 (MYF, VDB); Serranía Guanay, *Huber* 10954 (MYF, NY, VDB); 25 km ENE of Canaima, *Huber* 12108 (MYF, VDB); El Puaji, *Liesner* 19412 (MO, VDB, VEN); Cerro Guaiquinima, N Valley, *Maguire* 32921 (NY, US); Cerro Pitón, *Maguire & Steyermark* 53666 (NY); Sierra Pakaraima, *Steyermark* 107264 (MO, NY); Meseta Jaua, *Steyermark et al.* 109420 (F, K, NY).

After a sustained effort to distinguish variety *guayanensis* Maguire from variety *rigida*, I had to give up. What I found was a series of specimens from the highlands of northern Brazil and southern Venezuela that were proportionally taller, coarser, with larger floral parts (thus spikes), and with considerably more anthocyanic pigmentation than that for most *A. grandis* var. *grandis*, a plant normally of lower elevations. But what has been described as two varieties from the uplands is an inextricable mix of morphologies, thus forcing me, however interesting the extremes, to consider all these as parts of one variety, with the oldest available name for them being variety *rigida*.

19. *Abolboda macrostachya* Spruce ex Malme, Bih. Kongl. Svenska Vetensk-Akad. Handl. 26: Afd. 3. 19: 15. 1901. TYPE: Venezuela. Territorio Federal Amazonas: "prope Esmeralda, ad flumen Orinoco, Dec. 1853," *R. Spruce* 3229 (lectotype, S; isoelectotypes, BM, P, K, NY).

19a. *Abolboda macrostachya* var. *macrostachya*. Figure 24.

A. macrostachya Spruce ex Malme var. *angustior* Maguire, Mem. New York Bot. Gard. 10: 10, fig. 31n. 1958. TYPE: Venezuela. Territorio Federal Amazonas: Sabana Venado, Caño Pimichín, Río Guainía, 140 m, 23 Nov. 1953, *Maguire, Wurdack & Bunting* 36342 (holotype, NY; isotypes, GH, NY, VEN).

Stiff, smooth perennial, often robust, usually tufted, from a simple or branched-caudiciform, thick (to 2 cm) rhizome, the roots spongy-thickened. Rosette leaves numerous and fairly uniform, spirally imbricate at base, spreading or ascending, primarily lorate-linear or linear-triangular, highly variable in size, 7–35 cm long, (4–)6–20 mm wide, firm but flattened, narrowing gradually above a clasping, broad, multinerved, convex base to the blade, this flat, lingulate or involute, at apex narrowly acute to acuminate, the margins there con-

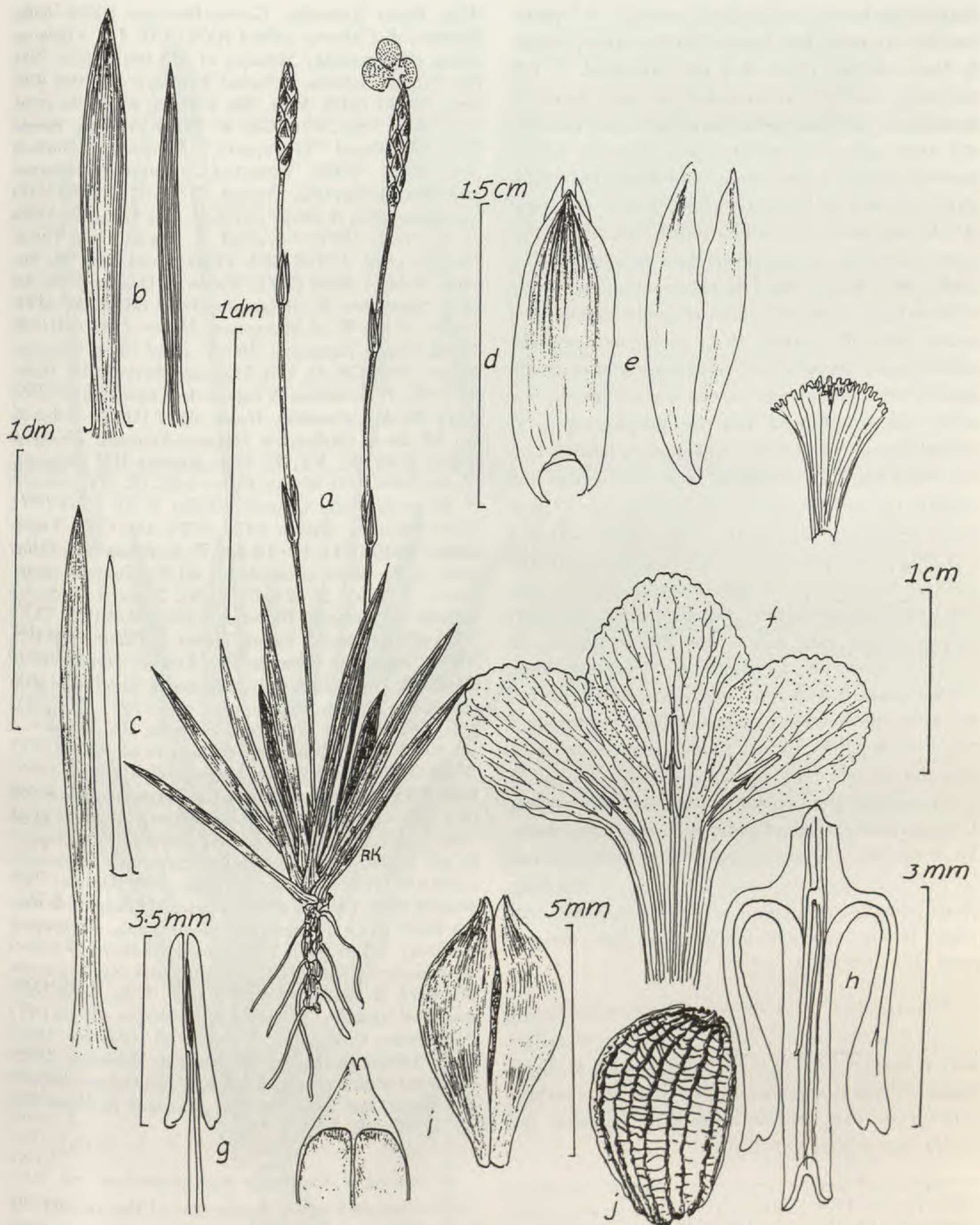


FIGURE 24. *Abolboda macrostachya* var. *macrostachya* (Maguire & Politi 28069); Wurdack & Adderley 42758).—a. Habit.—b. Various leaf outlines.—c. Various leaf outlines.—d. Fertile bract (sepal tips projecting beyond).—e. Corresponding sepals.—f. Spread corolla.—g. Stamen.—h. Style base with appendages; stylar apex (above corolla).—i. Capsule; at leaf an inner view of valve apex.—j. Seed.

verging to form a thickened, short- or long-subulate tip, the blade border narrow, hyaline, thin, pale, entire, the surface green, finely multinerved adaxially, more coarsely nerved and darker abaxially.

Scapes rigid, 1 to several per rosette, erect, subterete, 17–54 cm long, 2–3 mm thick toward tip, invested at base by 2–3, often anthocyanic, scarious-bordered, chaffy, lance-oblong bracts to 4 cm

long; scape bracts commonly 2, rarely 1 or 3 pairs, the lowest pair slightly longer, lance-ovate or broadly lance-oblong, those of a pair subequal, 1–1.8 cm long, conduplicate-rounded, at apex acute to acuminate, with the costa short-excurrent, the dorsal area green or anthocyanic, striately multinerved; spikes 1 per scape, multiflowered, cylindrical, ellipsoid or lance-cylindrical, 3.5–8 cm long, 8–10 mm thick, the bracts tightly spirally imbricate, all fertile, or the lowermost sterile (rarely), and slightly larger, most bracts ovate-oblong, 1.4–1.6 cm long, acute, the backs strongly convex with ovate, strongly nerved, deep green or variously anthocyanic dorsal areas, producing a short, subapical, erect, blunt mucro, the border broad, hyaline, pale or suffused with pale purple; sepals 2, elliptic-lanceiform, strongly and sharply folded, 15–17 mm long, their narrowly acute tips projecting slightly beyond the tip of subtending bract, their keels broad, curved, entire, firm; corolla 2.0–2.5 cm long, blue-violet, the spreading lobes broadly obovate to reniform or suborbicular, shorter than the tube; staminodia not evident; anthers narrowly oblong, white aging yellow, the thecae slightly divergent below, deeply sagittate, 3–3.5 mm long, on filaments 3.5–4 mm long; gynoecium over 2 cm long, the slender triquetrous base producing 3 recurved appendages 5–6 mm up from ovary summit, the laterals narrowly flabellate-clavate, ca. 3–3.5 mm long, the central shorter and filamentous. Capsule firm-valved, obovoid, 6–7 mm long, slightly acuminate, a lustrous pale brown. Seeds obovoid to variously angulate-isodiametric, ca. 1 mm long, longitudinally irregularly coarsely dark-ridged, with many lower, transverse connecting ridges, the pattern thus reticulate.

Distribution. Locally abundant in moist to wet, mostly low-elevation savanna or at edges of gallery forest therein (50–200 m, occasionally in Territorio Federal Amazonas up to 1,250 m), southern Venezuela west into southeastern Colombia and south into Amazonian Brazil.

Additional material examined. BRAZIL. AMAZONAS: rd. to Igarapé Preto, 2 July 1979, *Calderon et al.* 2742 (INPA, K, MO, NY, US, VDB); Humaitá–Jacarecanga, 21 June 1982, *Teixeira et al.* 1266 (INPA, NY, VDB). RORAIMA: caatinga com Barcella, 30 Apr. 1974, *J. M. Pires et al.*, *Herb. Ipean* 14.489, 14.460 (GH, NY, US). COLOMBIA. VAUPES: Yapoboda, 10 Dec. 1943, *P. H. Allen* 3205 (GH, MO, US); Cerro Kañenda, 2–4 Nov. 1952, *Garcia-Barriga* 15055 (US); savanna, Guranjuda, *Garcia-Barriga et al.* 16028 (GH, NY, US); Cacagual, *Maguire et al.* 36285 (NY), 36287 (NY); Araracuara, 6 Sep. 1959, *Maguire & A. Fernandez* P. 44178 (GH, NY, US); Puerto Colombia opp. Maroa, *Maguire et al.* 41855 (NY); Yapoboda, *Schultes & Cabrera* 14242

(US); Cerro Kañenda, *Garcia-Barriga* 15055 (GH), *Schultes & Cabrera* 18361 (COL, GH, US, VDB); savanna of Yapoboda, *Schultes et al.* 18494 (GH, US); Río Paraná Pichuna, *Schultes & Cabrera* 19905 (GH, US), 20053 (GH); Mitu, Río Kubiyū, *Zarucchi et al.* 1132 (GH, US), 2010 (GH, K, VDB). VICHADA: Parque Nacional Natural “El Tuparro,” *Zarucchi & Barbosa* 3541 (MO, VDB). VENEZUELA. TERRITORIO FEDERAL AMAZONAS: Esmeralda, *Croizat* 127 (GH, MO, NY, US); Yapacana, *Holt & Blake* 757 (GH, US); Cucuri, *Davidse et al.* 17047 (MO); Cucurital de Yagua, Caño Yagua, *Davidse et al.* 17398 (MO, VDB); Santa Cruz, Río Atabapo, *Foldats* 3682 (NY); “Cerro la Trampa,” Río Autana, *Guanchez & Melgueiro* 3540 (MARNR, MYF, VDB); 10 km W of Manapiare, *Huber* 1238 (GH, US, VEN); Cerro Yapacana, *Huber* 1644 (US); Canaripo, *Huber* 1927 (GH, U, US); Yapacana Savanna III, *Huber* 2014 (K, NY); sabana N laguna de Yagua, *Huber* 2569 (NY); SE de Carmelitas, *Huber* 2681 (MYF, VDB); 30 km SE de la confluencia Orinoco–Ventuari, *Huber & Tillett* 2782 (K, NY, U, US); savanna III, Yapacana, *Huber* 2996 (US); Maroa, *Huber* 3405 (K, NY); sabanita N del medio Caño Canamé, *Huber et al.* 3754 (NY); Cerro Cucurito, *Huber* 3874 (NY); alto Caño Yagua, *Huber* 4849 (NY); 10–12 km W de Esmeralda, *Huber* 5055 (NY); ribera izquierda (S) del Río Guayapo medio, *Huber & Tillett* 5512 (US, VEN); 2 km al W de San Antonio del Orinoco, *Huber & Tillett* 5416 (US, VEN); 5 km al S de Laguna Yagua, *Huber & Tillett* 5482 (US, VEN); Yapacana Savanna III, *Kral & Huber* 70713 (MARNR, NY, VDB); Cerro Morocoto, *Level L.11* (NY, US); Cerro Sipapo, *Maguire & Politi* 27957 (F, K, NY, US), 28043 (NY); Yapacana Savanna III, *Maguire et al.* 30467; Cerro Moriche, *Maguire et al.* 30888 (NY), 30990 (NY); Cerro Duida, *Maguire & Wurdack* 34697 (GH, NY); Yapacana Savanna III, *Maguire et al.* 36600 (NY, US—paratype of var. *angustior*), *Maguire et al.* 30472 (NY, U), *Maguire et al.* 36598 (NY), *Maguire et al.* 41446 (NY); Esmeralda Savanna, *Steyermark* 57838 (F, NY, US); cerro Vinilla, SSW Ocamo, *Steyermark et al.* 130387 (MO); Yapacana, *Thomas & Rogers* 2606 (NY); 15 km above Guarinum, *Wurdack & Adderley* 42981 (GH, US); Sabana de Moyo, *Wurdack & Adderley* 43684 (GH); 20 km above San Fernando, *Wurdack & Adderley* 42758 (NY, US); 2 km below mouth of Atabapo, *Wurdack & Adderley* 42708 (NY); 5 km below Guarinum, *Wurdack & Adderley* 42850 (NY); Sabana de Moyo, *Wurdack & Adderley* 43664 (NY). BOLIVAR: morichal 2 km E of Río Orinoco between Río Horeda and Cerro Gavilan, *Wurdack & Monachino* 39957 (F, GH, K, NY, U).

A review of *Abolboda macrostachya* var. *macrostachya* and many duplicates of the variety *angustior* (most of these cited above) shows that the characters used to distinguish the two all blend.

19b. *Abolboda macrostachya* var. *robustior* Steyermark, *Fieldiana Bot.* 28: 104. 1951. TYPE: Venezuela. Bolívar: Gran Sabana NW Kavanayen at 1,220 m, 26 Oct. 1944, *Steyermark* 57349 (holotype, F; isotype, VEN). Figure 25.

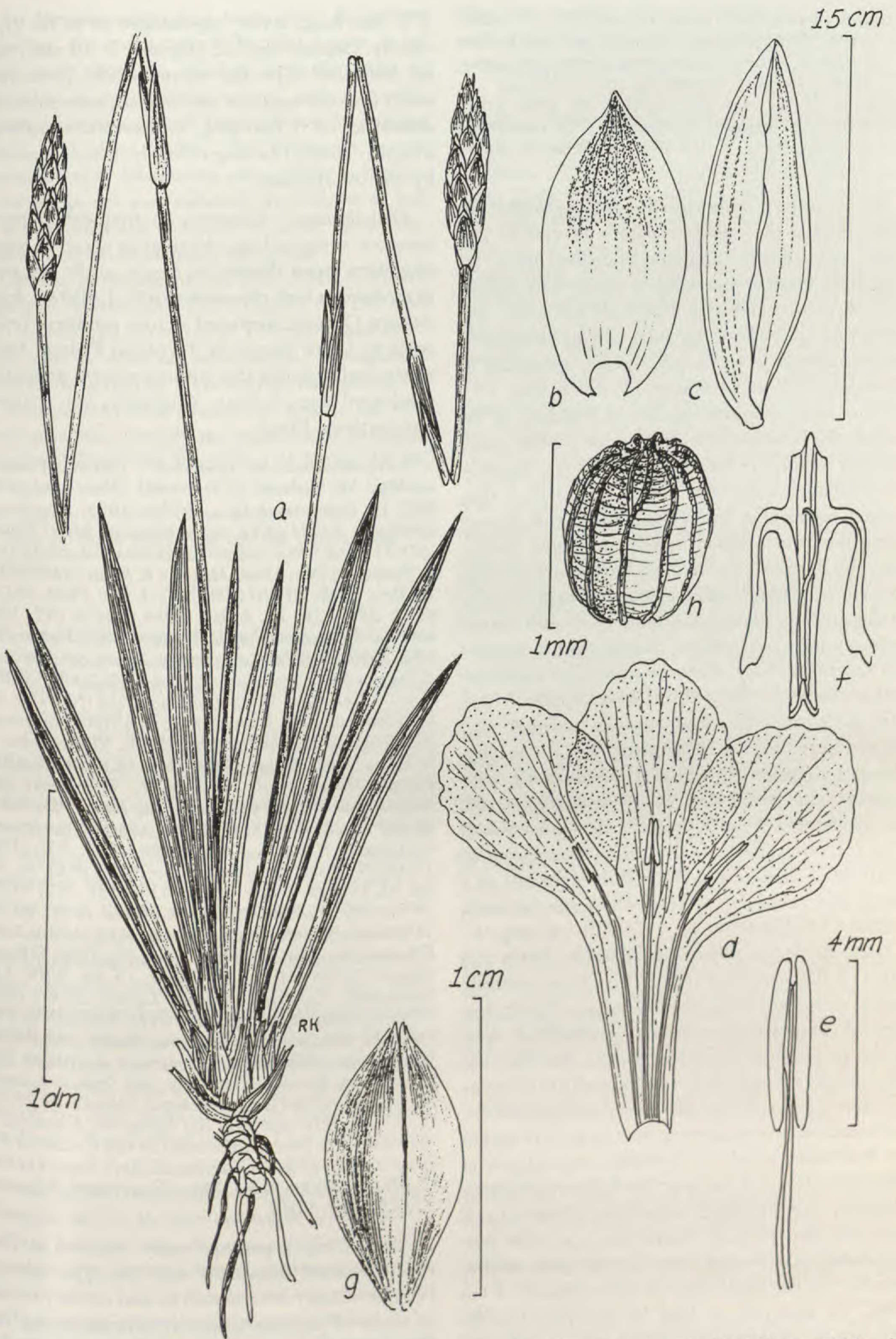


FIGURE 25. *Abolboda macrostachya* var. *robustior* (Liesner 24093; Steyermark 127613).—a. Habit.—b. Fertile bract.—c. Lateral sepal pair.—d. Spread corolla, stamens.—e. Stamen.—f. Style base with appendages.—g. Capsule.—h. Seed.

A. rigida Gleason, Bull. Torrey Bot. Club 58: 17. 1929. TYPE: "British Guiana," *Schomburghk 146.S.* (lectotype, K—specimen at right on type sheet; specimen at left is *A. grandis* var. *rigida* Malme).

A. excelsa Malme, Ark. Bot. 25A(12): 16. 1933. TYPE: Venezuela. Bolívar: "In Sumpfen, Río Cuquenán, Februar 1910," *E. Ule 8545* (lectotype, K; isolecotypes, L, MG).

As in variety *macrostachya* but typically far more robust, the rosettes solitary or tufted, the stems caudiciform, simple or branched, thick, to 1 dm long, erect or ascending, 1–2 cm thick, naked at base, above cloaked in chaffy old leaf bases and appearing sub-bulbous, the roots spongy-thickened. Leaves several to many per rosette, spreading to ascending, stiff, mostly linear, 15–45 cm long, 10–25 mm wide, compressed, flat or lingulate or in-folded, the base broadly clasping, to 25 mm wide, strongly multinerved on the convex backs, abruptly or gradually constricted above for up to 1 dm, thence broadening to an elliptic-linear or linear-triangular blade, above middle narrowing gradually, the narrow, pale, hyaline borders converging to form a subulate, sharp point, the surfaces pale, bright green or glaucous, multinerved, with nerves stronger on abaxial surface. Scapes rigid, 1–several per rosette, axillary, terete or sometimes angulate-sulcate, fistulose, 60–120 cm long, distally 3–4.2 mm thick, smooth, often strongly suffused with purple; scape bracts 1(–2) pairs, 4–6.5 cm long, those of a pair erect, subequal, lance-oblong, conduplicate, the rounded backs strongly multinerved, the medial area green or purplish, the border broad, pale (or rarely deep purple), thin, converging to acute or acuminate tip, the midrib excurrent as a short cusp or mucro; spikes solitary and terminal, mostly cylindrical-ellipsoid, 4–7(–10) cm long, 1–1.5 cm thick, multiflowered, all bracts fertile and erect (or the lowermost sterile), broadly to narrowly ovate, 1.4–2 cm long, the lower ones slightly longer, all with strongly rounded, multiribbed, deep green or purplish pigmented backs, the thin, hyaline borders broad, converging apically to an acute or short-acuminate tip, the medial area raised distally and sometimes short-excurrent as a low mucro or short cusp; sepals 2, navicular, lance-elliptic in side view, 1.6–2.3 cm long, the tips conspicuously exerted, the thickened medial area produced to a narrow, thin but firm, entire keel, the sides longitudinally low-nerved, the nerves often anthocyanic; corolla bright blue or violet-blue, 3–4 cm long, the lobes ca. as long as the tube, broadly obovate to suborbicular; staminodia usually not evident, when present filamentous; anthers narrowly oblong, 3.5–4 mm long, yellow, on filaments

4–5 mm long; stylar appendages as in the type variety. Capsule obovoid-ellipsoid, 9–10 mm long, the thickened valve tips narrowly bifid. Seeds variously obovoid-angulate and faceted, sometimes isodiametric, ca. 1 mm long, with several straight or irregular coarse ribs longitudinally, these connected by narrow alveolae.

Distribution. Common to frequent in rapateaceous savanna bog, clearings in shrub or edges of gallery forest therein, in sandy, acidic wet sites at medium to high elevations (600–1,900 m), from eastern Guyana westward across southern Venezuela to Cerro Sipapo in Territorio Federal Amazonas, and probably (but without records presently) southward from Bolívar, Venezuela, into contiguous northern Brazil.

Additional material examined. GUYANA. Pakaraima Mts., Mt. Aymatoi, 15 Oct. 1981, *Maas et al. 5692* (NY, U); Samwarakna-tipu, 10 Nov. 1951, *Maguire & Fanshawe 32521* (NY); upper Mazaruni River, *Pinkus 223* (F). VENEZUELA. TERRITORIO FEDERAL AMAZONAS: Cerro Sipapo, 15 Dec. 1948, *Maguire & Politi 27682* (NY), 25 Dec. 1948, *27910* (GH, NY), 1 Jan. 1949, *28112* (NY), *28117* (F, K), 6 Jan. 1949, *28176* (NY, US). BOLIVAR: Guiaquinima-tepui, 11 May 1987, *Aymard C. 5977* (MO, PORT); Río Apongua, cruce con carretera El Dorado–Sta. Elena, *Burandt et al. V1052* (MO, UCOB); Cerro Auyan, Jan. 1949, *Cardona 2614* (NY, US); 24 km S La Ciudadella, *Davidse et al. 4768* (MO); cabaceras Río Waiparu, *Fernandez 2050* (MYF, VDB); 20 km al N Kama-Marú, 4 abr. 1985, *Holst et al. 2226* (MO); Parupa, *Huber et al. 7217* (MYF, VDB); entre San Francisco de Yuruani y Chirimata, 21 June 1983, *Huber & Alarcon 7544* (MYF, VDB); 8–10 km SSE San Ignacio de Yuruani, *Huber & Febres 9188* (MYF, NY, VDB); 15 km N "Paso Pacheco," *Huber 9223* (NY); ca. 40 km NE Uriman, *Huber et al. 9915* (MYF, NY, VDB); 10 km SW Wadakapiapue-tepui, *Huber 11964* (MYF, VDB); Salto Carapo, *Huber 12406* (MYF, VDB); 2 km E Kavanayen, *Kral 72093* (MO, NY, US, VDB); El Puaji, *Liesner 19356* (MO, VDB, VEN); 15 km WSW Karaurin-tepui, Quebrada Tanuan, *Liesner 24093* (MO, VDB); Ilu-tepui, *Maguire 33356* (NY), *33528* (NY); 140 km S El Dorado, Río Apongua, *Rutkis 545* (VEN); Uarama-tepui, NE Luepa, *Steyermark & Nilsson 594* (NY); mesa between Ptari-tepui and Sororopan-tepui, *Steyermark 60243* (F); Auyan-tepui, *Steyermark 93502* (F, K, NY, US); cabeceras Río Apongua, Arauta-paru, *Steyermark & Dunsterville 104114* (NY); valley of Río Cama at km 199.9 S of Río Cama, *Steyermark 111318* (F, NY, U); 50 km N Sta. Elena, *Steyermark & Liesner 127613* (MO, VDB).

This variety is perhaps easily confused in Territorio Federal Amazonas with the type variety, because variety *macrostachya* can be very robust in some of the low-elevation savanna along the Orinoco and its tributaries. However, such large individuals typically have very short scape bracts, and the tips of their lateral sepals do not project

as far beyond subtending bract tips. In variety *robustior*, the usual case is for the scapes to be much more elongate, thicker, and the habit in general to be much more coarse, with a greater degree of purple or red pigmentation in scapes, bracts, and often leaves. This increased purple pigmentation of foliage and other parts in higher-elevation species and varieties, in contrast to less of it in species and varieties of lower elevations, seems to occur throughout the genus.

Gleason, in examining the type of his *Abolboda rigida* (*Schomburghk 146.S*) at K, did not note that the material is a mixture. The right-hand specimen must be what he refers to as "*A. rigida*," particularly in that he gives correct dimensions for *A. macrostachya* var. *robustior* spikes; the left-hand specimen, actually the more ample example, is material fitting the description of Malme for his *A. rigida*, which is now *A. grandis* var. *rigida*. The degree to which these authors relied on one or both of these examples on the single sheet is unclear.

20. *Abolboda linearifolia* Maguire, Mem. New York Bot. Gard. 10: 14. 1958. TYPE: Venezuela. Territorio Federal Amazonas: Yapacana Savanna III, 125 m, 31 Dec. 1950, *Maguire, Cowan & Wurdack 30468* (holotype, NY; isotypes, GH, NY, US). Figure 26.

Smooth perennial from a scaly, variously elongate, sparingly branched rhizome 3–6 mm thick, the roots spongy-thickened. Rosettes few-leaved, terminal at rhizome tips, the principal leaves 11–36 cm long, the sheaths thin, with convex, multicostate backs, narrowing \pm abruptly from a broadly clasping base to 10 mm wide into narrowly linear, erect or ascending blades 2–3 mm wide, these compressed but firm, apically abruptly rounded to acute, mucronate or short-subulate, the margins forming a narrow hyaline border, the upper surface slightly concave or plane, finely striate-nerved, the lower surface coarsely 3–5-ribbed longitudinally. Scape erect, usually 1 per rosette, 20–25 cm long, 1.5–2.3 mm thick distally, there terete or with a few broad ribs; scape bracts 1 pair, subequal, at $\frac{1}{2}$ – $\frac{2}{3}$ way up scape, erect, lance-oblong, 1–2 cm long, the tips acute to subulate-spinulose, the borders broad, scarious, pale, the convex backs firm, coarsely nerved; spikes narrowly cylindrical-ellipsoid, solitary and terminal, 2.5–5.5 cm long, 6–8 mm thick, many-flowered, the erect bracts all fertile, oblong-ovate, 12–15 mm long, broadly acute, with broad, pale scarious bor-

ders, the convex backs multiribbed and usually anthocyanic or deep green medially; sepals 2 or 3, the laterals elliptic-lanceolate, 10–12 mm long, the firm keel broadly alate, the apex narrowly rounded, the inner sepal oblong, scarcely keeled, mostly scarious, ca. 7–8 mm long; corolla ca. 2 cm long, bright blue, the broadly elliptic lobes ca. 1 cm long, spreading; anthers lance-oblong, ca. 3 mm long, yellowish, on filaments ca. 2.5 mm long; style ca. 2 cm long, the triquetrous base with 3 appendages, the laterals pendulous, irregularly claviform, acute, ca. 2.5 mm long, the central appendage reduced and slightly above the laterals. Capsule ca. 5 mm long, the valves elliptic, thickened and deeply notched apically. Seeds nearly isodiametric, ca. 0.7 mm long, coarsely reticulate, the longitudinal ribs slightly stronger and spiral.

Distribution. Locally abundant in low-elevation, mostly white sand savanna (50–200(–400) m) from Territorio Federal Amazonas, Venezuela, west into southeastern Colombia (Vaupés) along the Río Orinoco, Río Negro, and tributaries. Probably also in contiguous Brazilian savannas.

Additional material examined. COLOMBIA. VAUPES: Puerto Inírida, Río Inírida, 14 ago. 1975, *García-Barriga 20831* (GH, US), 20855 (GH); W of Río Guainía N of Boca de Casiquiare, 5 Feb. 1980, *Liesner & Clark 9111* (MO, VDB). VENEZUELA. TERRITORIO FEDERAL AMAZONAS: cerro Chipital, E cerro Chipital, *Guanchez 1087* (TFAV, VDB); Cerro Yapacana, *Huber 1599* (NY, US); bajo Ventuari, *Huber 4858* (NY); Yapacana Savanna I, Jan. 1951, *Maguire et al. 30789* (GH, NY—paratype); Pimichín, Nov. 1953, *Maguire et al. 36381* (NY—paratype), 36382 (NY—annotated as a possible hybrid between *A. grandis* and *A. macrostachya*); Yapacana III, *Maguire et al. 36622* (NY, US—paratype); Caño Hechimoni above mouth Río Siapa, *Maguire et al. 37642* (NY—paratype); Yapacana savannas, Sep. 1957, *Maguire et al. 41495* (GH, NY); Sabana Pacimoni, Oct. 1957, *Maguire & Wurdack 41680* (F, K, NY, US); Yavita, Jan. 1942, *L. L. Williams 14045* (F, US); 5 km below Guarinumó, June 1959, *Wurdack & Adderley 42855* (NY).

The comparatively blunt-tipped, uniformly linear leaf blades and the rhizome character distinguish this from the closely related *Abolboda macrostachya*. Some of the narrower-leaved extremes of *A. macrostachya* (described as *A. macrostachya* var. *angustior*) may indeed be products of gene exchange between the two species. However, I believe these are mostly separable on the basis of a distinct taper of leaf blade and a stouter rootstock in *A. macrostachya*, in contrast to the lack of taper of leaf blade and a narrow rootstock in *A. linearifolia*.

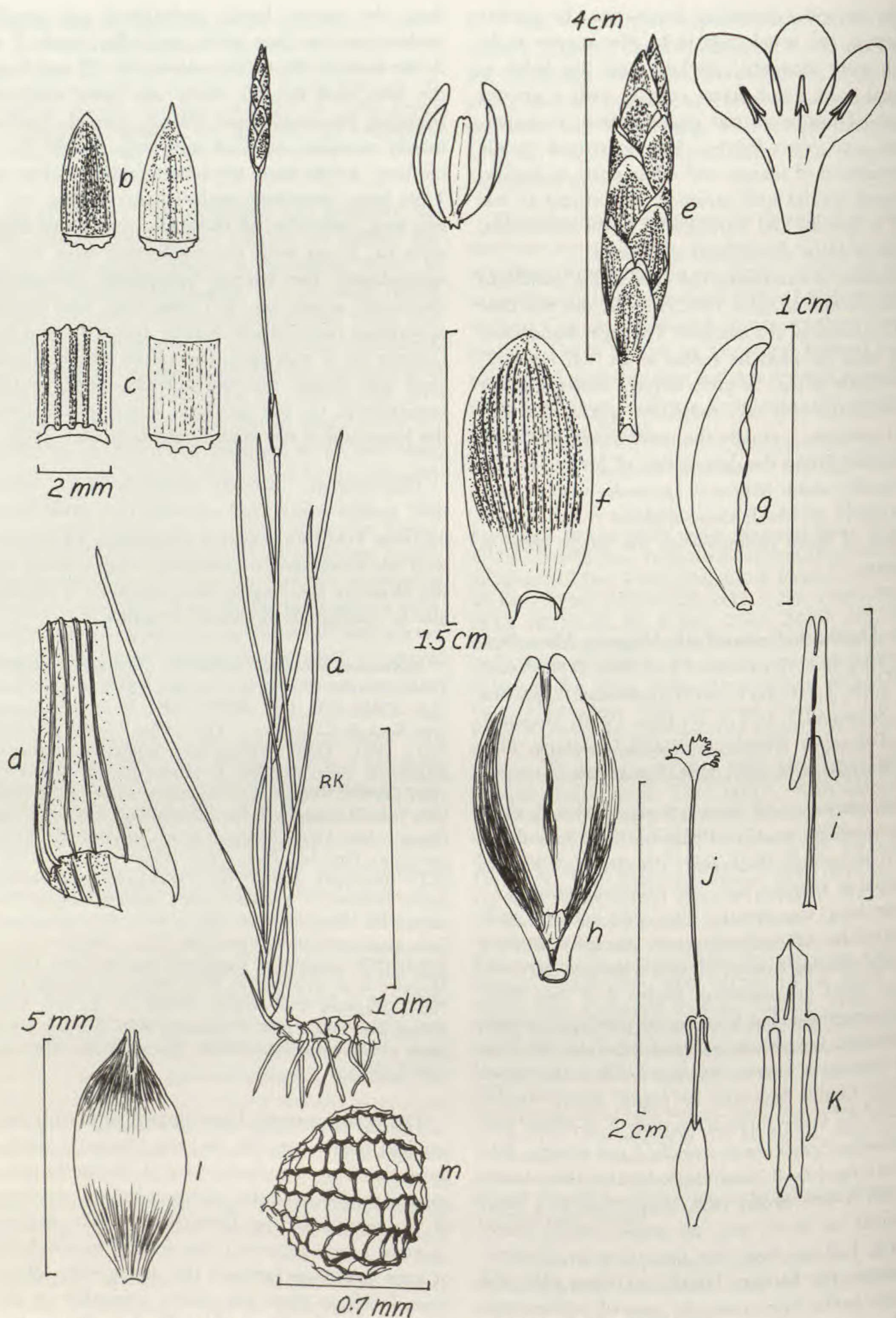


FIGURE 26. *Abolboda linearifolia* (Maguire, Cowan & Wurdack 30468).—a. Habit.—b. Leaf tip, two sorts.—c. Abaxial (left) and adaxial (right) views of a sector of leaf midblade.—d. Leaf base.—e. Spike and upper scape (middle); calyx (at left) showing 3 sepals; spread corolla, stamens (at right).—f. Fertile bract.—g. Lateral sepal.—h. Inner view to show relative position of sepals within fertile bract.—i. Stamen.—j. Gynoecium.—k. Enlarged view of stylar base with appendages.—l. Capsule, external view of one valve.—m. Seed.

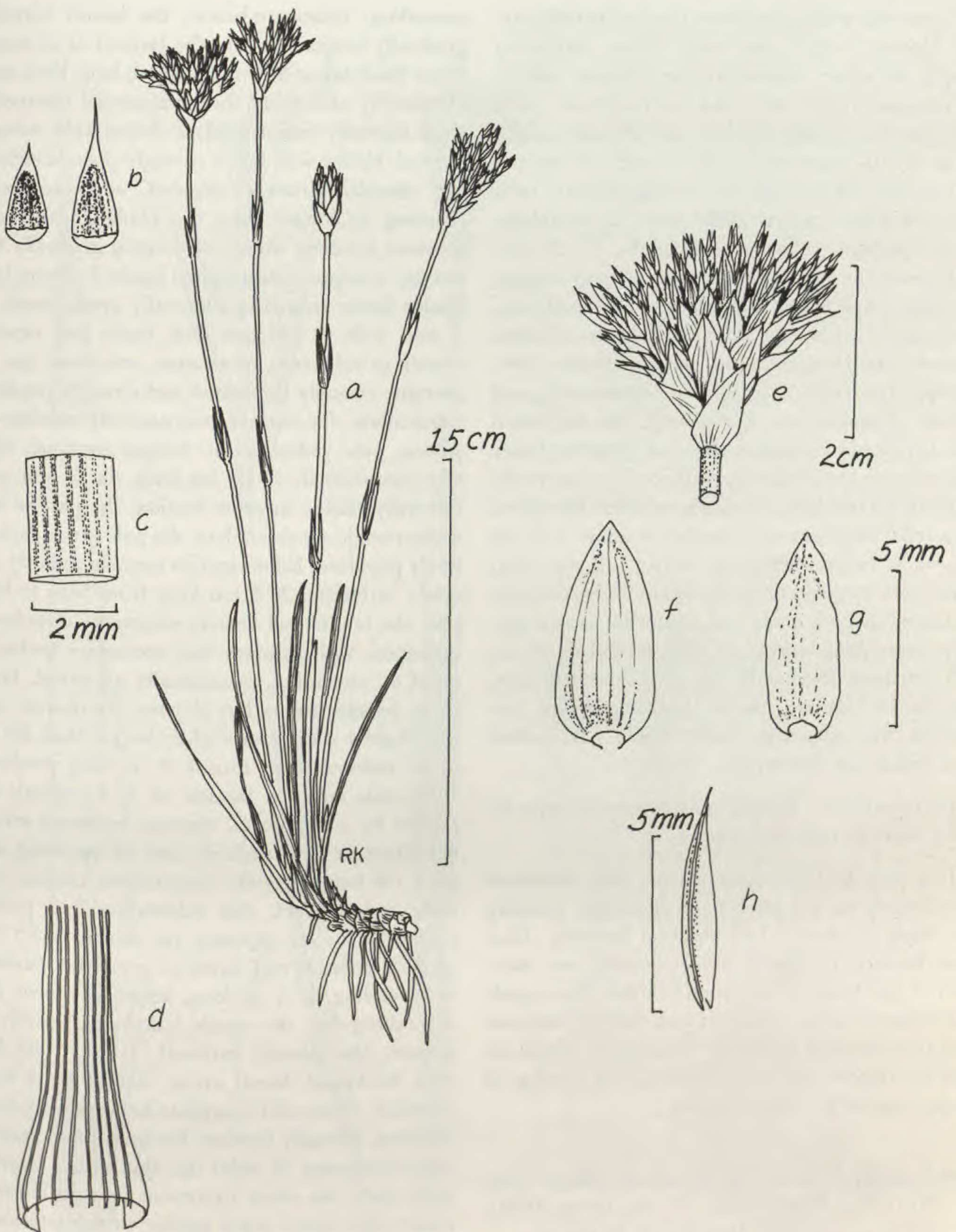


FIGURE 27. *Abolboda* × *glomerata* (Maguire & Wurdack 35593).—a. Habit.—b. Leaf tips.—c. Sector of leaf at midblade, abaxial side.—d. Leaf base.—e. Inflorescence.—f. Lower inflorescence bract.—g. Spike bract, abaxial side.—h. Lateral sepal.

21. *Abolboda* × *glomerata* (Maguire) Kral, stat. nov. *Abolboda glomerata* Maguire, Mem. New York Bot. Gard. 10: 14. 1958. TYPE: Venezuela. Territorio Federal Amazonas: Sabana Venado, left banks of Caño Pimichín above Puerto Pimichín, affluent Río Guainía, 140 m, 14 Apr. 1953, Maguire & Wurdack

35593 (holotype, NY; isotype, US). Figure 27.

Glabrous perennial from a stout horizontal rhizome ca. 6 mm thick, the roots spongy-thickened. Leaves few, stiff, spreading-ascending, 5–10 cm long, the stramineous, thin, multicostate sheaths

ca. 5 mm wide at clasping base, narrowing to linear, firm blades, 2–2.5 mm wide, these narrowed abruptly to acute, mucronate or subulate apices, the margins rather thin but with narrow, pale, cartilaginous, wirelike borders, the adaxial surface flat or slightly concave, finely nerved, the abaxial surface coarsely nerved and usually convex, both sides dull green. Scapes stiffly erect or ascending, 16–27 cm high, yellow green, distally 15–23 mm thick, terete or somewhat angled, coarsely costate to striate; scape bracts 2 pairs, erect, lance-oblong, subequal, 1–2 cm long, involute, the tips subulate to acute, the borders broad, pale, scarious; inflorescence a narrowly to broadly turbinate or ellipsoid fascicle of spikes, ca. 2 cm long, the individual spikes mostly lanceoloid or ellipsoid-cylindric; lower inflorescence bracts (involucre) broadly to narrowly ovate, 8–15 mm long, those above within the spikes numerous, progressively shorter, in spikes 1–2 cm long, these bracts ascending, ovate, 5–8 mm long, acute, with strongly nerved, convex, green or purple-tinged median areas and somewhat keeled apically, subtending lanceolate, thin, lateral sepals ca. 6–8 mm long, these with tips acuminate-subulate, with backs carinate, the keel strong, entire, excurrent, the sides thin, pale; flower parts other than sepals not developed.

Distribution. Known only from the type locality and not collected since.

It is suggested that these plants, while abundant according to record, are genetic anomalies, possibly the result of chance hybridization between *Abolboda linearifolia* and *A. macrostachya* var. *macrostachya*. As no floral structure other than sepals is developed in the spikes, it can only be assumed that reproduction is strictly vegetative, clonal either by rhizome or by a toppling and rooting of scapes within the inflorescence.

Achlyphila Maguire & Wurdack, Mem. New York Bot. Gard. 10(2): 12, fig. 1a–m. 1960.
TYPE: *A. disticha* Maguire & Wurdack.

1. **Achlyphila disticha** Maguire & Wurdack, Mem. New York Bot. Gard. 10(2): 12. 1960.
TYPE: Venezuela. Territorio Federal Amazonas: Cerro de la Neblina, 2,000 m, 14 Dec. 1957, B. Maguire, J. J. Wurdack & C. K. Maguire 40402 (holotype, NY; isotypes, US, VEN). Figures 28, 29.

Stiff, slender, papillose-scabrid perennial herb from branched, slender, horizontal, short-internoded, branched rhizomes to 3 mm thick, the roots slender-fibrous. Leaves distichous, stiff, erect or

ascending, imbricate-based, the lowest scalelike, gradually longer upstem, the longest at or toward scape base, lance-linear, 8–12 cm long, their bases completely sheathing the compressed internodes, these laterally compressed, 2–3 mm wide, strongly nerved; blades with bases strongly open-sheathing, the sheaths strongly infolded, scabrous-keeled, equaling or longer than the blades, with broad, scarious borders, these converging gradually to a strong, scarious, blunt-tipped ligule 2–4 mm long; blades linear-triangular, laterally compressed, 2–3 mm wide at junction with ligule and tapering evenly to subterete, incrassate, setaceous tips, the margins strongly thickened and strongly papillose-tuberculate, the surfaces transversely rugulose-papillose, pale yellow-green. Scapes terminal, laterally compressed, 7–15 cm long, ca. 3 mm wide, narrowly elliptic in cross section, the narrow hard edges papillose-tuberculate, the pale green surfaces finely papillose. Inflorescence terminal, mostly narrowly turbinate, 3–6 cm long from base to bract tips, the bracts and flowers essentially distichously arranged, with primary and secondary peduncles erect or ascending, occasionally excurved; bracts as in foliage leaves but shorter, the lowest erect and slightly shorter or slightly longer than the rest of the inflorescence, thus 4–6 cm long, producing from axils either a fascicle of 3–4 pedicels subtended by a lanciform, scarious-bordered secondary bract or 2–3 pedicels and an opposing short (to 1 cm long) laterally compressed, costate internode and a bract, this subtending 2–3 pedicels subtended by an opposing yet shorter bract (prophyll?); pedicels stiff, erect or somewhat excurved to ascending, 1–3 cm long, linear-claviform; flowers subregular, the sepals lanciform, spirally imbricate, the laterals external, 1.5–1.7 cm long, with thickened dorsal areas crested by a broad, rounded, tuberculate-papillate keel and with broad, scarious, strongly involute borders, these converging-overlapping at sepal tip, this with a scarious-bifid apex, the costa excurrent as a stiff, scaberulous cusp; inner sepal similar to the laterals but less spreading and shorter; petals 3, distinct to base and unclawed, obovate to rhombic, 1.2–1.4 cm long, yellow, the apex narrowly rounded, the margins undulate or sinuate; staminodia lacking; stamens opposing petals and hypogynous, the anthers tetrasporangiate and bilocular, at anthesis broadly lanciform, 2.5–3 mm long, the apex shallowly notched, the base with locules widely divergent along a broadened, thin connective, sagittate, there joined to the slender tip of a broad-based, somewhat flattened filament 5–5.5 mm long; ovary oblong-trigonous, ca. 3.5 mm long; style ca. 2 mm long,

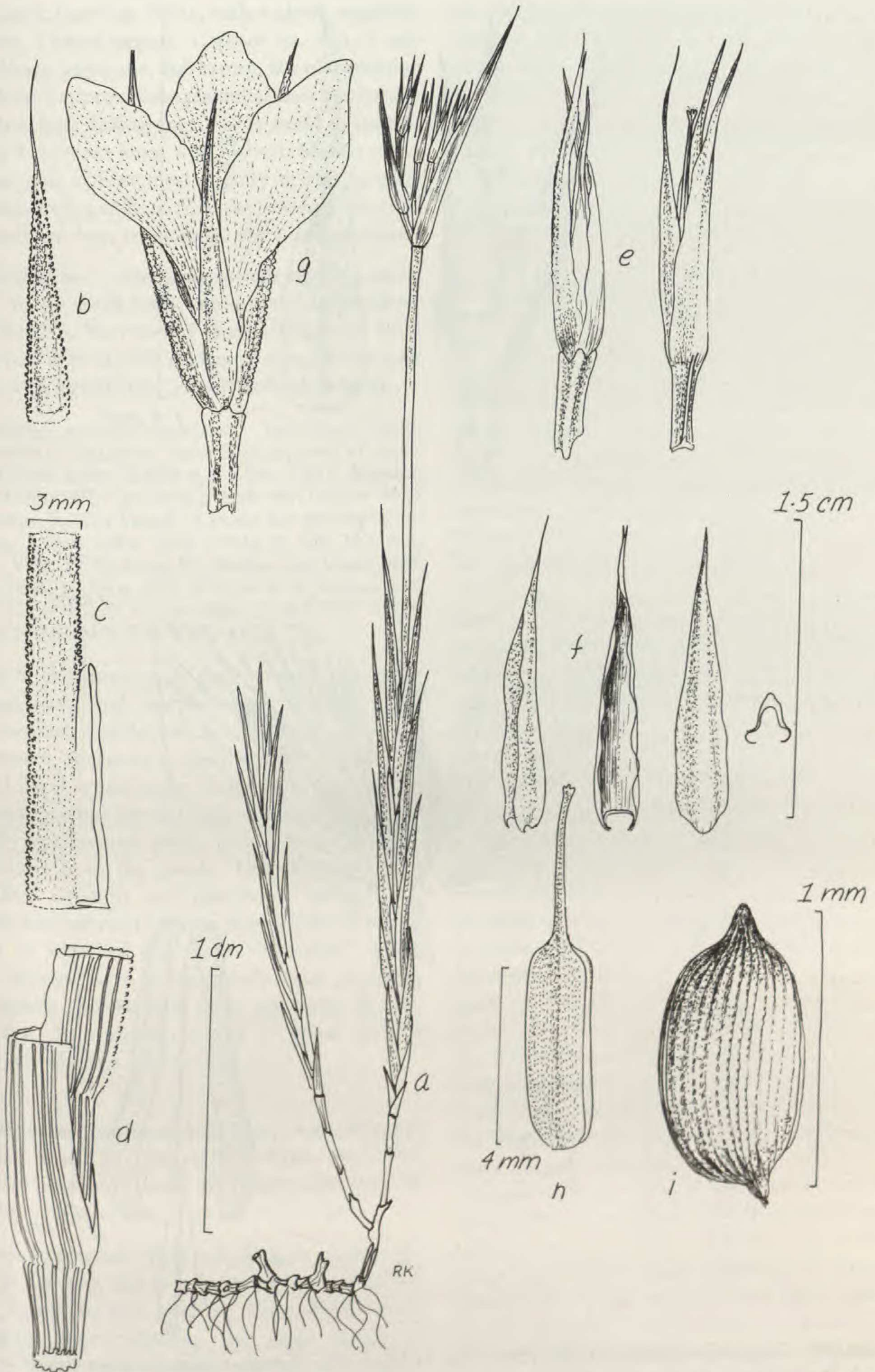


FIGURE 28. *Achlyphila disticha* (Kral 71924).—a. Habit.—b. Leaf tip.—c. Leaf at junction of blade and sheath, side view.—d. Two nodes with blades cut away above base.—e. Two views of fruiting calyx.—f. Lateral (left), inner (middle), and outer (right) views of a lateral sepal.—g. Flower.—h. Capsule.—i. Seed.

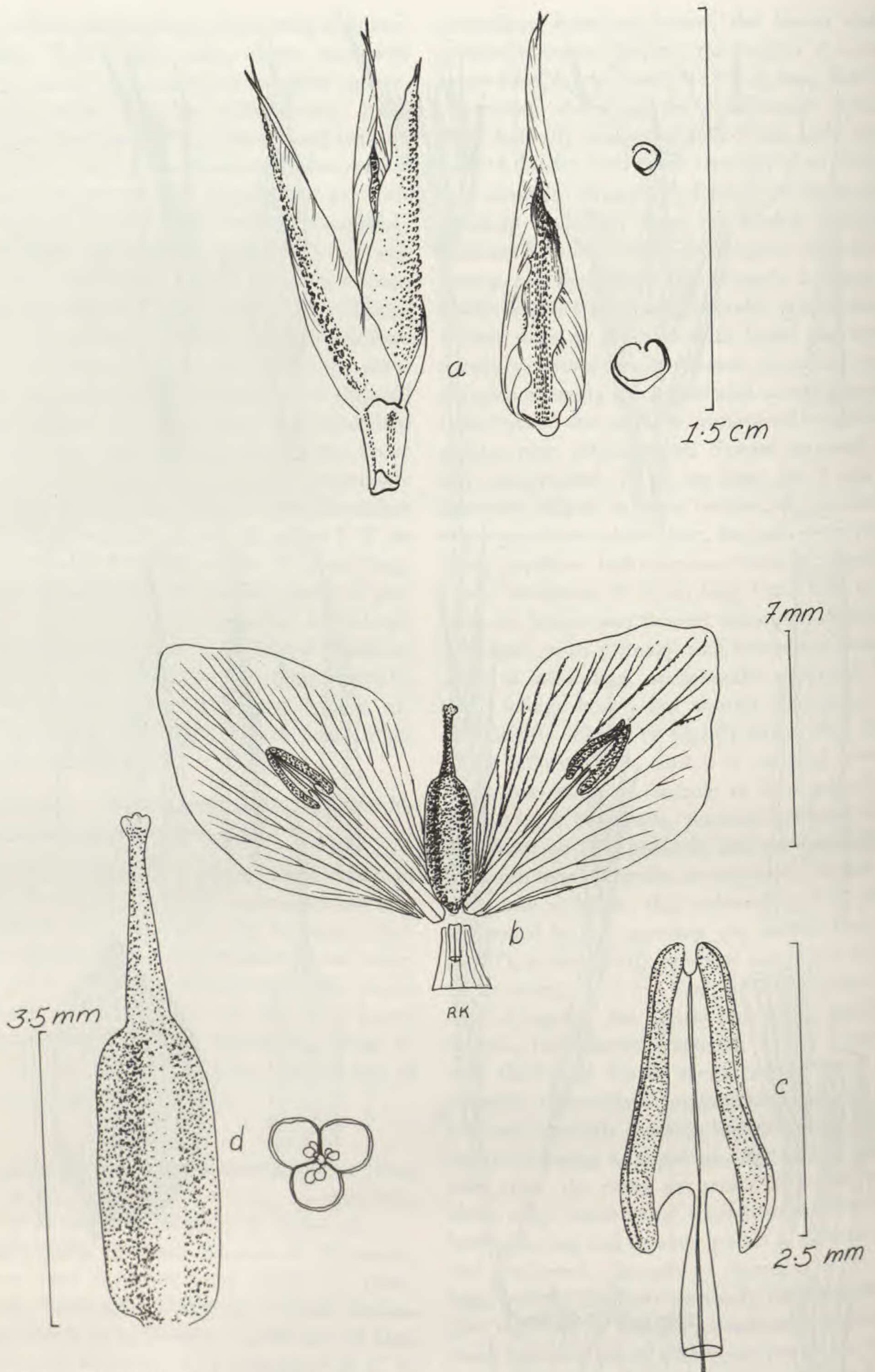


FIGURE 29. *Achlyphila disticha* (Kral 71924).—a. At left, mature calyx; at right, an inner view of a lateral sepal.—b. Spread flower showing relative positions and dimensions of petals, stamens, and gynoecium.—c. Enlarged view of anther at anthesis.—d. Side view of capsule with persistent style (left); diagram of cross section of young capsule (right).

stiffly erect, tapering-linear, with a short, capitate, shallowly 3-lobed stigma. Capsule ca. 4.5–5 mm long, oblong-trigonous, dull brown, the placentation axile along 2 approximate placental lines per locule, the valves later falling free. Seeds ovoid to subglobose, 0.9–1.0 mm long, with a short, bluntly conic apiculus and with several slightly spiral, longitudinal, minutely papillate ribs, the intervals marked by numerous, low, transverse short connections.

Distribution. Abundant locally in peaty, moist to wet, rocky shrub bogs, summit elevations along Cerro Neblina, Territorio Federal Amazonas, Venezuela (ca. 800–2,300 m), thus, along a common border with Brazil (this as yet undocumented).

Additional material examined. VENEZUELA. TERRITORIO FEDERAL AMAZONAS: near E escarpment of upper Canón Grande basin, 2,000 m, 14 Dec. 1957, *Maguire et al.* 42386 (NY—paratype); Valle de Titirico, N of Pico Phelps, Neblina Massif, by rocky but wet ridges, ca. 2,300 m, 1 Dec. 1984, *Kral* 71924 (F, GH, MO, NY, SP, US, VDB, VEN); Camp III, Neblina and Massif, NW Plateau (arm) 13.5 km ENE of Cerro de la Neblina Base Camp, 1,750–1,850 m, on ridge, 16–18 Feb. 1984, *Liesner* 16049 (MO, NY, VDB, VEN).

This is the monotypic genus whose discovery led anatomists and morphologists to treat Abolobodaceae and Xyridaceae as one family, because it possesses characters intermediate to both. Its general floral organization is the most primitive in the family except for the lack of staminodia. It is the only xyridaceous genus in which the stamens are distinct from the petals. The elongate stems with their equitant and distichous, strongly ascending and imbricate leaves form plates of leaves similar to some of the more "primitive" xyris, which likewise have a completely axile placentation, namely species such as *X. ptariana*, *X. witsenioides*, *X. xiphophylla*, all of which have a similar distribution and ecology.

Aratitiopea Steyermark & Berry, *Ann. Missouri Bot. Gard.* 71: 297. 1984. TYPE: *Aratitiopea lopezii* (Lyman B. Smith) Steyermark & Berry. Figure 30.

Robust perennial from a trailing or repent rhizome to 2 m long and to 1.5 cm thick, the rhizomal nodes numerous and annular, the reddish brown internodes short-cylindric, the roots slender-fibrous. Outer part of rhizome densely cloaked by spirally imbricate scales (the scales being remnants of old leaf bases), passing gradually into a sprawling or ascending leafy shoot. Leaves spirally imbricate, numerous and crowded toward shoot apex, the principal ones spreading or ascending, lorate-lin-

ear, ligulate, the longer ones downstem, 20–40 cm long, 20–40 mm broad, strongly compressed, narrowly acute to slenderly acuminate, upstem proportionately gradually shortening and with broader outline, more spreading, more broadly acute, all blades with thin, entire, subscarios and often crisped margins, and smooth, deep-lustrous-green, finely nerved surfaces; leaf bases broadly clasping, and here a lustrous pale to deep brown, immediately above this somewhat constricted, thence upblade gradually broadening, thence from midblade to tip evenly narrowing to blade apex; inner (upper) foliage leaves ringing a dense, subcapitate, chaffy-involucrate head, this convex mass hemispheric, of many bracts subtending flower clusters and ringing the complex, the outer bracts broadest, mostly 5–7 cm long, lanciform, ecarinate and sharply acute, the inner ones directly subtending flowers narrower, ca. as long, all distinctly paler than the foliage leaves, mostly with red-purple, entire borders and tips, the center paler, cream with flecks of red, appearing pale pink, the surfaces smooth, finely striate-nerved. Sepals 3, comparable to inner bracts in outline and length, the outer (lateral) 2 infolded inequilaterally, their bases spirally imbricate, the keel sharp and usually anthocyanic, entire; inner sepal ecarinate but with a median sharp, narrow costa. Corolla salverform, actinomorphic, pale purple, 7–10 cm long from base to tip of lobes, the tube narrowly cylindrical, dilated over the broad ovary, at apex abruptly broadening to 3, ascending to spreading-recurved oblong, lingulate, broadly rounded or shallowly retuse lobes 1.5–2.2 cm long; stamens 3, epipetalous, arising just below the base of each lobe, the filaments erect, slender, flattened, the anthers golden, narrowly oblong-linear, 4–5 mm long, the anther apex slightly emarginate, the connective producing a median apiculus, the base shallowly auriculate. Ovary dorsiventrally compressed, greenish, obovate, trilocular with 3 locules and 6 placentae, the slender style ca. 8 cm long, below triangled and producing at each angle at very base 3 appendages, these at their callused, subtruncate bases doubled back and terminating in narrowly to broadly flabellate, unevenly crenate, thin tips which touch the ovary summit; stylar apex 3-branched, producing 3 connivent, bristly-hairy, broad stigma lobes. Ripe fruit thin-walled, greenish, dorsiventrally compressed, oblong-ellipsoid to obovoid, 1.2–1.4 cm long, the apex obscurely 3-lobed, in profile subtruncate or broadly rounded, the slightly depressed center produced to a short-broad apiculus (very base of style). Seeds numerous, broadly ellipsoid to subglobose, mostly subsymmetric, pale brown to deep brown,

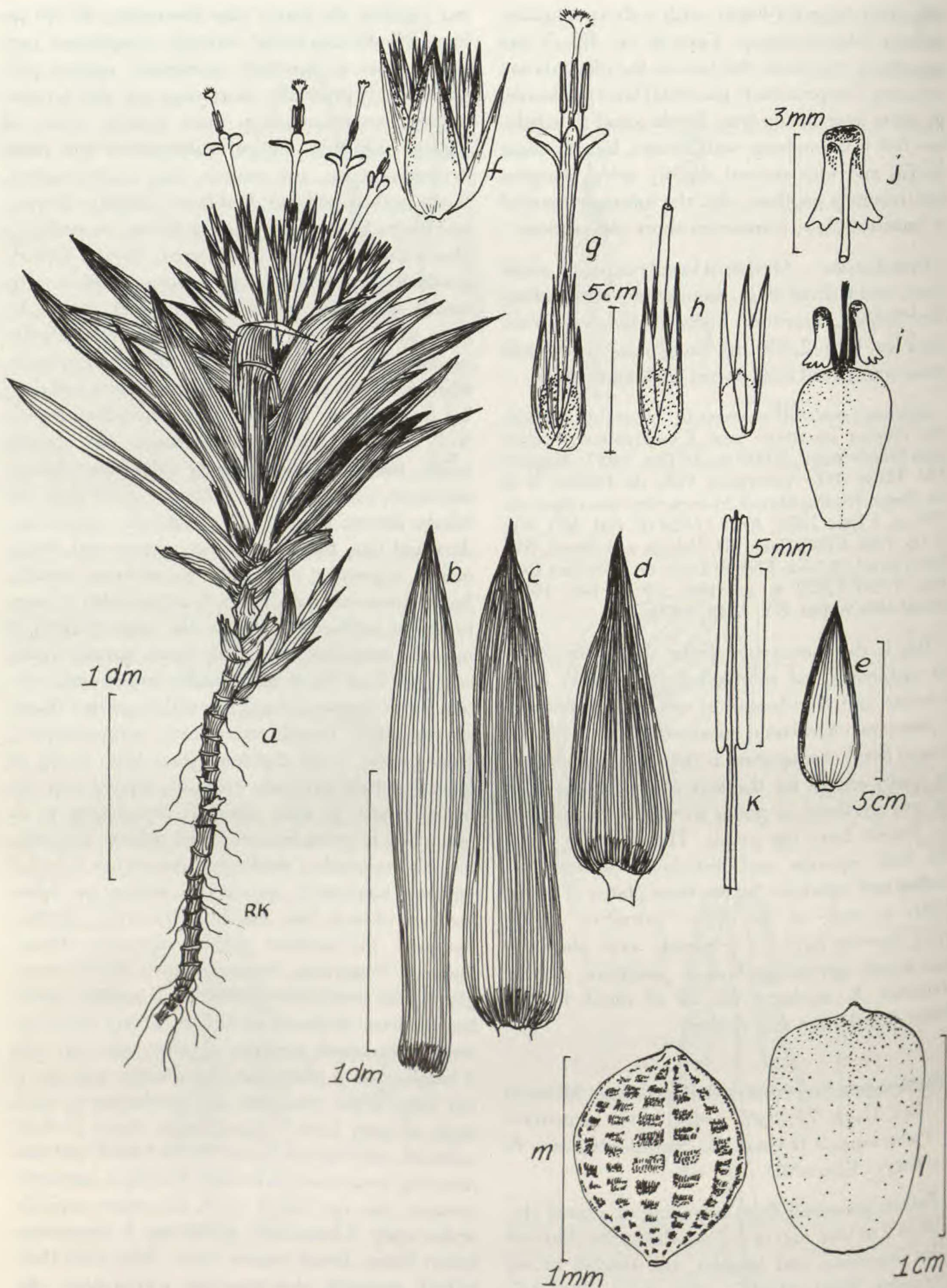


FIGURE 30. *Aratitoyoepa lopezii* var. *lopezii* (Maguire & Politi 27742).—Habit.—b. Principal foliage leaf, upper stem.—c. Uppermost principal leaf.—d. Foliage leaf directly subtending involucre.—e. Outer bract of flower base.—f. Flower cluster.—g. Flower at anthesis, subtended by two inner bracts.—h. Calyx with enclosed floral base (outer view, left); calyx with enclosed ovary (inner view, right).—i. Gynoeceal base, showing appendages at styler base.—j. Appendage, inner view.—k. Anther, with portion of filament apex.—l. Capsule.—m. Seed.

longitudinally with 12–14 strong ribs, and numerous lower cross-ribs in the intervals, thus reticulate-alveolate.

KEY TO VARIETIES OF *ARATITIOPEA LOPEZII*

- 1a. Larger leaves 20–40 cm long, 2–4 cm wide; heads 3–7 cm across base, 7–15 cm broad, 7–10 cm high; floral bracts 5–7 cm long, red-purple with paler median zones; sepals ca. as long, roseate-bordered; corollas (fide *Steyermark & Berry*) pale purple 1a. *A. lopezii* var. *lopezii*
- 1b. Larger leaves 10–18 cm long, 1.5–2.5 cm wide; heads 2–3 cm across base, 4–7 cm broad, 4–5 cm high; floral bracts 3–4 cm long, purple outside, yellowish to purple inside; sepals ca. as long, pinkish or pinkish-bordered; corollas white or near white 1b. *A. lopezii* var. *colombiana*

1a. *Aratitiopea lopezii* (Lyman B. Smith) Steyerm. & Berry var. **lopezii**, Ann. Missouri Bot. Gard. 71: 297, fig. 1A–K. 1984. *Navia lopezii* Lyman B. Smith, Bot. Mus. Leaflet 15: 40. 1951. TYPE: Brazil. Amazonas: Cerro Dimiti, upper Rio Negro basin, on rocks, 800 m, 12–19 May 1948, *Schultes & Lopez* 9956 (holotype, US-1985318; isotype, US-1985319). Figure 30.

See genus description and key.

Distribution. Territorio Federal Amazonas of southwestern Venezuela, northwestern Brazil, and southeastern Colombia (Vaupés), usually on wet, open or shaded, rocky faces, 250–1,600 m.

Additional material examined. VENEZUELA. TERRITORIO FEDERAL AMAZONAS: Cerro Avispa, *Dunsterville & Dunsterville*, Dec. 1972 (US); Cerro Avispa, Río Siapa, *Dunsterville & Dunsterville s.n.* (US); Cerro Sipapo, lower N escarpment, Nov. 1948, *Maguire & Politi* 27497 (US); spray of waterfalls, Caño Profundo, Jan. 1949, *Maguire & Politi* 28276 (US); Cerro Aratitiope, ca. 90 km SSW de Ocamo, 24–28 fev. 1984, *Steyermark et al.* 130088 (MO, US), 130289 (MO); Río Siapa just below Raudal Gallipeta, July 1959, *Wurdack & Adderley* 43564 (US).

The discussion of the species given by Steyermark & Berry (1984) appears largely to be based upon *Aratitiopea lopezii* var. *lopezii*, the widest-ranging and most-collected of the two varieties. For some reason, the authors did not include information on the variety *colombiana* (Lyman B. Smith) Steyerm. & Berry in their article, but simply made the transfer from *Navia* (Bromeliaceae). Doubtless this was because of the paucity of material available. From the few examples I have available on loan (three sheets at US, all from Cerro Isibukuri by Río Kananari in Vaupés, Colombia,

two (one the type) collected 4 August 1951, and one the following year (23–25 January), these could be from the same population. Differences between the two varieties appear to be largely quantitative. The habit is the same, but the rhizome of variety *colombiana* is narrower; the leaves of variety *colombiana* are similarly shaped but smaller, as are involucral bracts and sepals. The colors (as given by Schultes & Cabrera, the collectors of the Vaupés material) appear to be different from those of the type variety, as bracts are described as “purple-brown” or “purple inside and out.” Bract color on the type specimen is given as “purple outside, pinkish or yellowish inside.” Flowers (none available on the material) are described as white on the type label, “whitish” on one of the paratypes.

A later and more detailed, field-oriented survey of the two varieties may show a running together of the two. In any case, this species should be cultivated, as it is without question (even from one who has seen only color slides of it) the most beautiful of the Xyridaceae yet found. From examination of specimens without flowers and from viewing the color photographs, it is easy to see how these plants were first placed in the Bromeliaceae.

1b. *Aratitiopea lopezii* (Lyman B. Smith) Steyerm. & Berry var. **colombiana** (Lyman B. Smith) Steyerm. & Berry, Ann. Missouri Bot. Gard. 71: 299. 1984. *Navia lopezii* var. *colombiana* Lyman B. Smith, Bot. Mus. Leaflet 16: 195. 1954. TYPE: Colombia. Vaupés: Río Kananari, Cerro Isibukuri, piedra de arenisca, 250 m, 4 Aug. 1951, *R. E. Schultes & I. Cabrera* 13342 (holotype, US; isotypes, GH, COL).

See key to varieties and discussion under variety *lopezii*.

Distribution. Shaded and sunny, wet, rock outcrops, Vaupés, southeastern Colombia, 250–700 m.

Additional material examined. COLOMBIA. VAUPÉS: Río Kananari, Cerro Isibukuri, 4 ago. 1951, *Schultes & Cabrera* 13393 (US); Río Kananari, Cerro Isibukuri, base of mountain, 23–25 Jan. 1952, *Schultes & Cabrera* 15078 (US).

Orectanthe Maguire, Mem. New York Bot. Gard. 10: 2–3. 1958. TYPE: *Abolboda sceptrum* F. Oliver.

Coarse, smooth, perennials 0.5–2 m high; stems either short, stout, producing dense basal rosettes, or lax, decumbent, elongate and cloaked by higher,

looser spirals of leaves. Leaves polystichous, narrowly panduriform, 5–40 cm, firm, bases dilated, clasping with a broad, maroon or red-brown patch, blades variably linear, lingulate to flat, finely multinerved, apically sharply subulate, margins thin, entire, aging lacerate. Scapes 1–several from axils of upper leaves, fistulose, terete, 0.2–2 m, to 2 cm thick at base; spikes burrlike, multiflorous, hemispheric to broadly turbinate or globose, 5–10 cm broad across spreading sepal tips; outer bracts in 1(–2) whorls of 3, often empty, floral bracts much shorter than sepals, ovate to broadly lanceolate. Sepals 3, subequal, lanciform-navicular, acuminate, the laterals with broad curved keel, the third thinner and without keel; petals connate, unequal, forming a spreading-recurved, yellow (rarely reddish), two-lipped corolla to 6 cm long, limb about as long as recurved tube and throat, trilobed, upper lobe largest, broadest, forming a hood, the lower 2 spreading outward, forward, slightly down and forming the lower lip; staminodes none; stamens 3, adnate to upper corolla tube, filaments longer than anthers, anthers ca. 1 cm long; placentation axile; style elongate, apically curved, with terminal, patelliform, papillose, later fimbriolate, stigma; stylar appendages linear, firm, doubled back to form an inverted “U,” arising from ovary summit around style base and 2–2.4 cm long. Capsule ovoid to obovoid, trilobed, 1.5–2 cm, valves thick, tips shallowly bilobed; seeds numerous, irregularly curvate-triangular, 2–4 mm, edged with a broad wing around embryo, 1 edge forming a narrow, ascending, thumblike lobe, surface finely curved-striate, lustrous brown. Two species of northern South America.

Distribution. Southwestern Guyana across southern Venezuela into Territorio Federal Amazonas and southward into contiguous Brazil, on the Roraima sandstones, usually in boggy pockets among rocks and in full sun, at medium to high elevations (500–2,700 m).

KEY TO SPECIES OF *ORECTANTHE*

- 1a. Stem contracted, caudiciform, erect; leaves in dense basal rosette; outer cephalar bracts mostly with flowers, thus directly subtending lateral sepals; scapes mostly solitary, mostly longer than stem 1. *O. sceptrum*
 1b. Stem elongate, lax, often decumbent, or sprawling to 1.5 m or more; leaves in long, high spiral, not forming a distinct basal rosette; outer cephalar bracts empty; scapes 2 or more, shorter than stem 2. *O. ptaritepuiana*

1. *Orectanthe sceptrum* (F. Oliver) Maguire, Mem. New York Bot. Gard. 10(1): 3. 1958.

Abolboda sceptrum F. Oliver, Trans. Linn. Soc. London, Bot. 2: 286. 1887. TYPE: Guyana. Roraima summit, *in Thurn* 312 (holotype, K; isotype, US). Figures 31, 32.

Orectanthe sceptrum (F. Oliver) Maguire subsp. *occidentalis* Maguire, Mem. New York Bot. Gard. 10: 5. 1958. TYPE: Venezuela. Territorio Federal Amazonas: SE escarpment, Cerro Huachamacari, Maguire *et al.* 30140 (holotype, NY).

Robust, glabrous, sometimes glaucous, Yucca-like perennial, rosulate herb, (2–)4–15(–20) dm tall from a thick caudex, the roots coarse, fibrous, the stem erect or ascending, stout, to 2 cm thick, either short or elongating to 3 dm, simple or from branch buds of a rosette base. Leaves firm, spirally imbricate in tight or loose spirals, those of elongating shoots and branches ascending to spreading in loose spirals, those of flowering portion in flatter tight spirals, thus forming a rosette, the former type mostly linear and more lax, those of rosettes usually gladiately linear-triangular or lanceolate, spreading to erect, (5–)10–30(–40) cm long, blades flat, apically narrowly acute to acuminate, involute at tips to a callused point, the margins forming a deep red-brown, thin but firm and sharp entire border, this aging to be upwardly jagged, toward base usually somewhat constricted, then flaring to the broadly sheathing (1–6 cm wide) base and with a broad, brown to castaneous patch, the leaf bases persisting several seasons as a tight, chaffy, stubbly shingling on the stem. Scapes usually solitary at stem apex, less often 2 or few from axillae of rosette leaves, mostly erect, fistulose, terete, cloaked at base by 2–several, erect, short, involute sheath leaves and there 1–2 cm thick, overall tinted with red-purple or brown, rarely with 1–2 narrowly linear subscarious bracts toward base; spikes headlike, solitary and terminal, multiflorous, in bud ovoid, during and after anthesis with parts more spreading, broadly turbinate to broadly ovoid, but usually globose to hemispheric, 5–10 cm high, nearly as broad across the sepal tips; outer (involucral) bracts of 1 (rarely 2) series of 3, ovate to lanceolate, leathery-chaffy, rigid, 2–6 cm long, 7–15 mm wide, finely nerved, acute, entire, yellow-green or anthocyanic; flowers rigid-based and tightly imbricate, each consisting of 1 adaxial, appressed, lance-ovate bracts ca. ½ as long as sepals and 3 erect, subequal, connivent sepals to ca. 6 cm long, all imbricate in 1 flat spiral; lateral sepals lanceolate, to 6 cm long, chaffy, strongly folded, narrowly acute, subequilateral with a strong, broad, flat entire keel, the inner sepal adaxial, lanceolate but ecarinate, thinner, the borders narrowly involute but thin, apically more inrolled to a subulate tip;

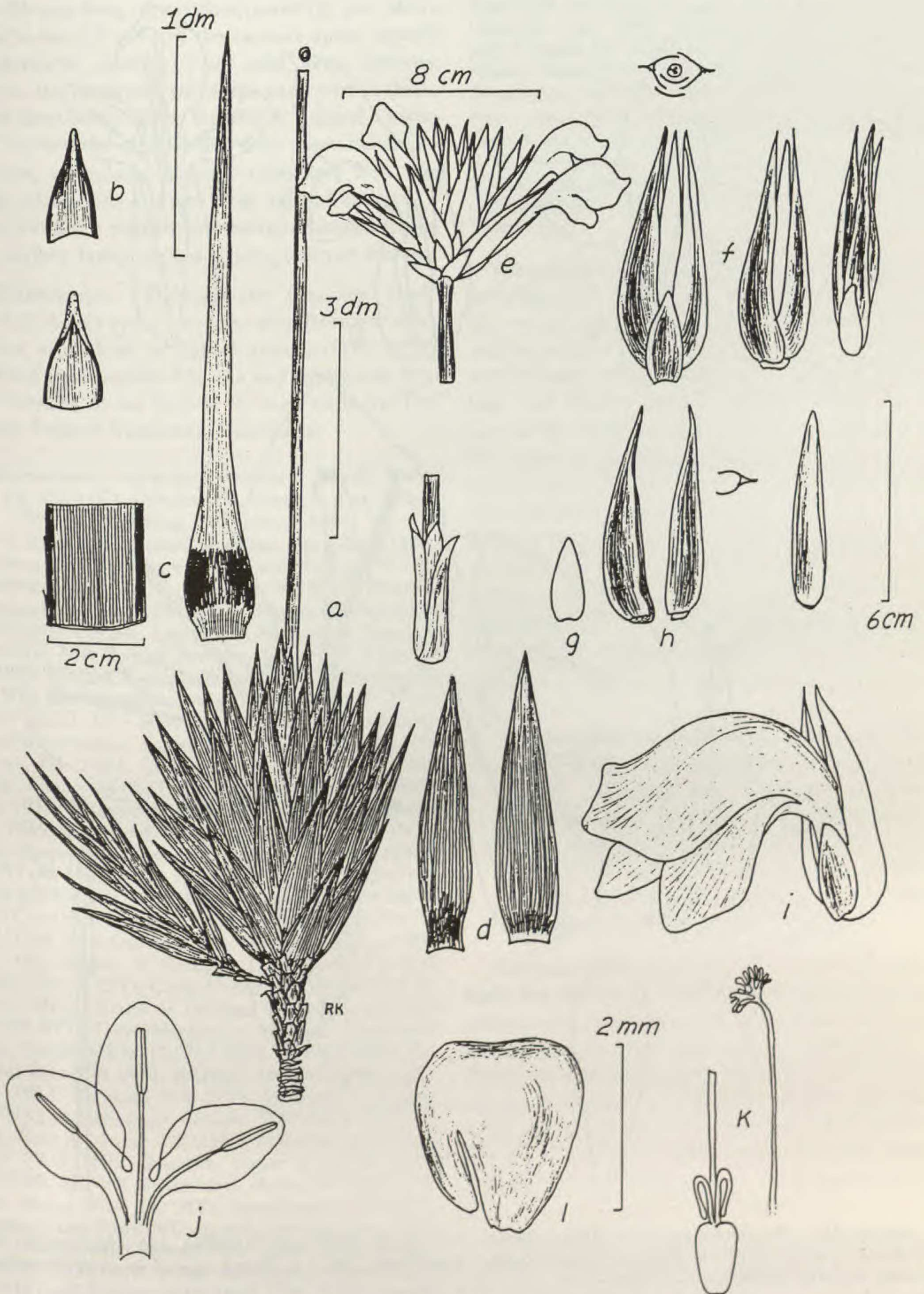


FIGURE 31. *Orectanthe sceptrum* (Huber 9569, Kral & Gonzalez 70470, Liesner 19337).—a. Habit (sector of upper scape removed).—b. Two leaf tips, abaxial side (above), adaxial side (below).—c. Sector of midblade, adaxial side (left) and abaxial view of entire blade (right).—d. Some shorter rosette leaves (below) and basal bracts of scape (left) and abaxial view of entire blade (right).—e. Flowering inflorescence.—f. Abaxial view of floral bract and calyx (left); inner view of calyx (middle); (above).—g. Floral bract.—h. Lateral sepals (left); inner sepal (right).—i. Flower, oblique view of floral bract and calyx (right).—j. Ideal view of spread corolla, stamens.—k. Ideal view of gynoecium.—l. Seed.

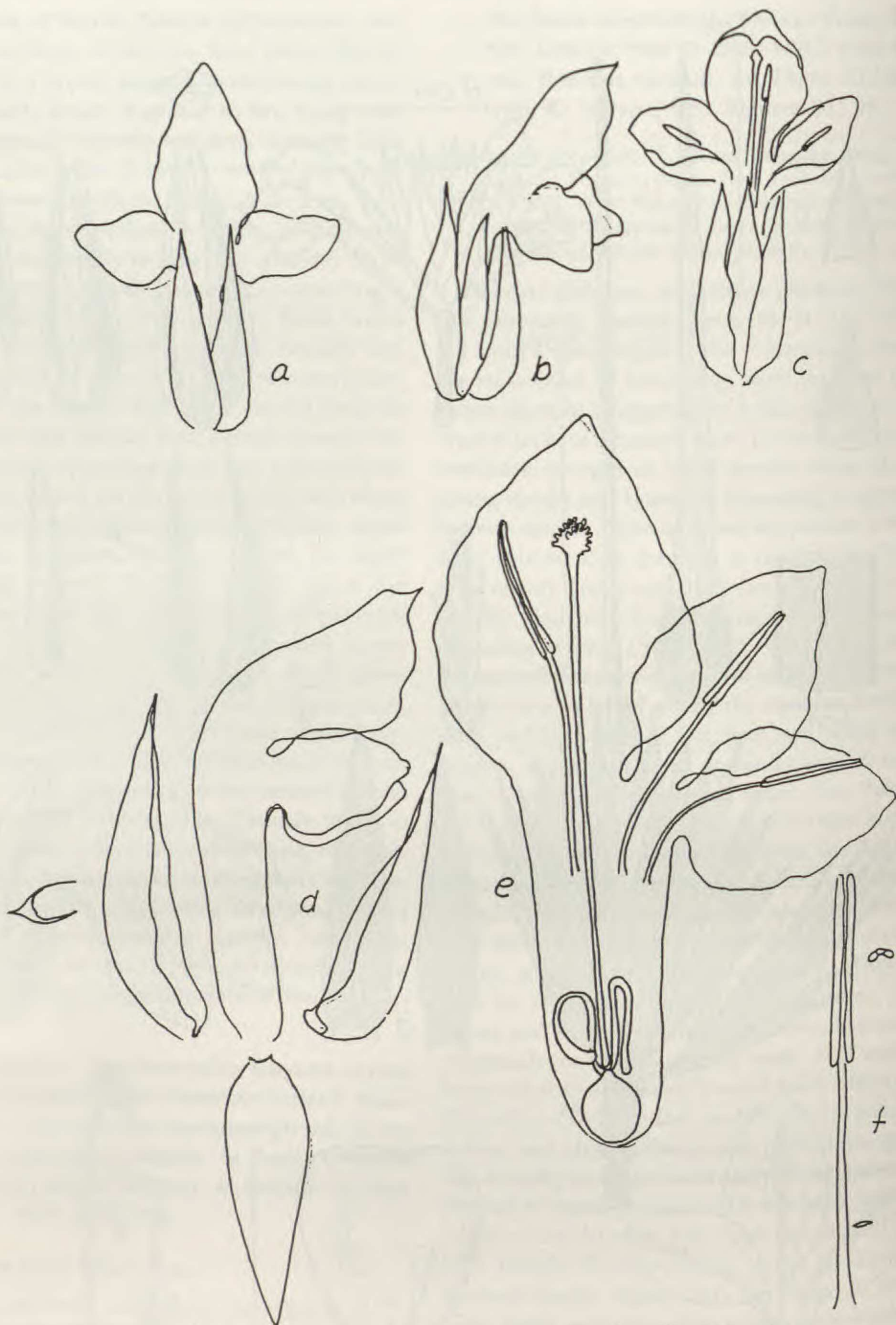


FIGURE 32. *Orectanthe sceptrum* (Huber 9569).—a-c. Inside (left), lateral (middle), and oblique (right) views of flower, scale omitted.—d. Exploded flower, corolla viewed from side.—e. Flower opened so as to show spread corolla, stamens, gynoecium.—f. Stamen.

corolla large for a xyrid, 6–8 cm long, zygomorphic, yellow, rarely purple, the lobes longer than the erect tube, broadly ovate, the upper one spreading and excurved, its margins spreading, the laterals spreading and directed downward (see figure); staminodia lacking; anthers oblong-linear, basi-

fixed, 10–11 mm long, on slender filaments 15–25 mm long, arising midway down corolla tube; style erect, 30–35 mm long, terete, briefly recurved apically to produce a glandular-fimbriolate oblique stigma pad, the ovary summit around its base producing 3 linear reflexed firm appendages

20–24 mm long, these disarticulating just above base to leave 3 nubs at the capsule apex; capsule thick-valved, ovoid, 15–20 mm long, lustrous, brown, the narrowed valve tips each with 2 thickened short lobes, these forming a 6-lobed “annulus” around the appendaged fruit apex. Seeds numerous, irregularly curvate-triangular, 2–4 mm long, edged with a broad wing around embryo, 1 edge forming a narrow, ascending, thumblike lobe, the surface finely curved-striate, lustrous brown.

Distribution. Through the Guayana Highlands, in boggy rocky savanna atop Roraima sandstones, at medium to high elevations (500–2,700 m) from southwestern Guyana and contiguous Brazil westward across Bolívar through southern Territorio Federal Amazonas, Venezuela.

Representative material examined. BRAZIL. RORAIMA: *Ule* 8559 (K). GUYANA. Mt. Roraima, Oct. 1884–Jan. 1885, *Mt. Roraima Expedition, Set C, no. 312* (K—a single small rosette); Roraima, Nov.–Dec. 1931, *Abbensetts* 37 (K—base with 3 scapes); Roraima, N ridge escarpment, Mar. 1978, *Edwards, K. E. R.* 106 (K); Imbaimadai Savannas, Oct. 1951, *Maguire & Fanshawe* 32254 (NY, US); Mt. Ayanganna, *Maguire & Bagshaw* 40567 (K, NH); Summit Roraima, *McConnell & Quelch* 668 (K); Roraima Escarpment, Oct. 1973, *Persaud* 83 (K, NY); Mt. Ayanganna, Aug. 1960, *Tillett & Boyan* 45097 (K, NY, US—several scapes per stem). VENEZUELA. TERRITORIO FEDERAL AMAZONAS: Camp III, Neblina, NW plateau, Feb. 1984, *Liesner* 15991 (MO); Cerro Marahuaca, *Liesner* 24764 (MO); Cerro Sipapo, West Peak, Dec. 1948, *Maguire & Politi* 2777 (GH, NY); Sipapo, Jan. 1949, *Maguire & Politi* 28106 (NY), 28451 (NY); Cerro Sipapo, North Mountain, *Maguire & Politi* 28569 (K, NY, U, US); Sipapo, South Escarpment, *Maguire & Politi* 28645 (NY); South Basin, *Maguire & Politi* 28678 (NY); Cerro Huachamacari, *Maguire et al.* 29822, 30079, 30213 (all NY); Cerro Neblina, *Maguire et al.* 37303 (NY, US); Neblina, W Savannas, *Maguire & Wurdack* 42166, 42418 (NY); Cerro Marahuaca, *Maguire et al.* 65563 (MO); Planicie de Zuloaga, Neblina, *Steyermark* 103824 (NY); Cerro Marahuaca, cumbre, *Steyermark et al.* 124394 (MO), 125981 (NY), 129486 (MO); Mt. Duida, *Tate* 398 (NY). BOLIVAR: Aprada Tepuy, ago.–sept. 1953, *Bernardi* 936 (NY); Auyan-tepui, *Bogner* 1000 (K); Matahui-tepui, *Castillo* 2284 (UCV, VDB); El Pauji, *Holst & Liesner* 2323 (MO); Murisipan-tepui, *Holst et al.* 2930 (MO); Chimantá, *Huber & Colella* 8953 (NY, VDB, VEN); Kukenan-tepui, *Huber* 9470 (NY); Ilu-tepui, *Huber* 9526 (K, NY); Aprada-tepui, 30 km E Uriman, *Huber* 9569 (NY—corolla lavender-rose), 9571 (NY—corolla pale yellow); Uei-tepui, *Huber* 10043 (MARNR, MYF, NY, VDB); Kavanayen, *Lasser* 1826 (NY); El Pauji, *Liesner* 19337 (MO, VDB, VEN); Tereke-Yuren, W edge, *Liesner et al.* 21099 (MO, VDB); Kukenan tepui, *Liesner* 23173 (MO, VDB); 15 km WSW Karaurin tepui, *Liesner* 24102 (MO); Ilu-tepui, Mesa Grande, *Maguire* 33342; Kavanayen, *Maguire* 33680 (MO); NE Luepa, *Steyermark & Nilsson* 597 (NY); Mt. Roraima, Emerald Swamp, *Steyermark* 58861 (F, GH, US—some plants with 4 scapes); Ptari-tepui, SW shoulder, *Steyermark* 59787 (F, GH, NY); mesa between

Ptari-tepui and Sororopan-tepui, *Steyermark* 60144 (F); Chimantá, Apr. 1953, *Steyermark* 74999 (F—plants with 8 scapes but leaves as in *O. sceptrum*); Chimantá Massif, *Steyermark* 75885 (F); Auyan-tepui, cumbre, *Steyermark* 93689 (K, NY); Cerro Jaua, cumbre, 24 feb.–7 mar. 1974, *Steyermark et al.* 109435 (NY); Cerro Guanacoco, cumbre, *Steyermark et al.* 109742 (NY); Cerro Roraima, cumbre, *Steyermark et al.* 112453 (F); Chimantá, *Steyermark et al.* 128355 (MO); Camarca/Barai/Tepui, *Steyermark et al.* 131999 (MO, US, VDB, VEN).

Orectanthe sceptrum is a highly variable species as to size, leaf dimensions, and bract character. In the western part of the range are many morphs corresponding to what Maguire called subspecies *occidentalis*, a lower plant with nonglaucous foliage and shorter cephalar bracts; in the eastern part of the range the plants are mostly taller, with the longer range of involucre bracts and cephalar bracts, and with the foliage tending toward glaucousness (subsp. *sceptrum*). However, these intergrade to the extent that it is difficult to assign even varietal rank. In the eastern part of the range, and adding to the problem, *O. ptaritepuiana* may be hybridizing with *O. sceptrum*, as some specimens there appear to be intermediate as to bract and scape.

2. *Orectanthe ptaritepuiana* (Steyerm.) Maguire, Mem. New York Bot. Gard. 10(1): 5. 1958. *Abolboda ptaritepuiana* Steyerm. Fieldiana Bot. 28: 104. 1951. TYPE: Venezuela Bolívar: Ptari-tepui, *Bonnetia roraimae* forest on SW-facing shoulder, 2,000–2,200 m, 2 Nov. 1944, *Steyermark* 59760 (holotype, F; isotype, GH). Figure 33.

Stems elongate, often to 15 dm or more, densely leafy but the leaves ascending in high spirals, the growth often sprawling, often branched, erect only toward tips, the leaf blades without red-brown border or this indistinct; scapes 2–several, as in *Orectanthe sceptrum*, but distinctly shorter than the leafy portion of the stem; involucre of 3 sterile, lanciform bracts distinctly longer than the inner (cephalar) bracts and up to 6 cm long. Flowers, fruit, and seed as in *O. sceptrum*.

Distribution. Boggy, rocky open sites, seeps on high cliffs and ledges, southwestern Guyana, westward into southeastern Bolívar, Venezuela, and (probably) southward into contiguous Brazil at 500–2,700 m.

Additional material examined. GUYANA. Summit Mt. Wokomung, July 1989, *Boom & Samuels* 9087 (NY, VDB); Mt. Ayanganna, *Tillett et al.* 45125 (NY). VENEZUELA. BOLIVAR: Cerro Guaiquinima, *Cardona* 967

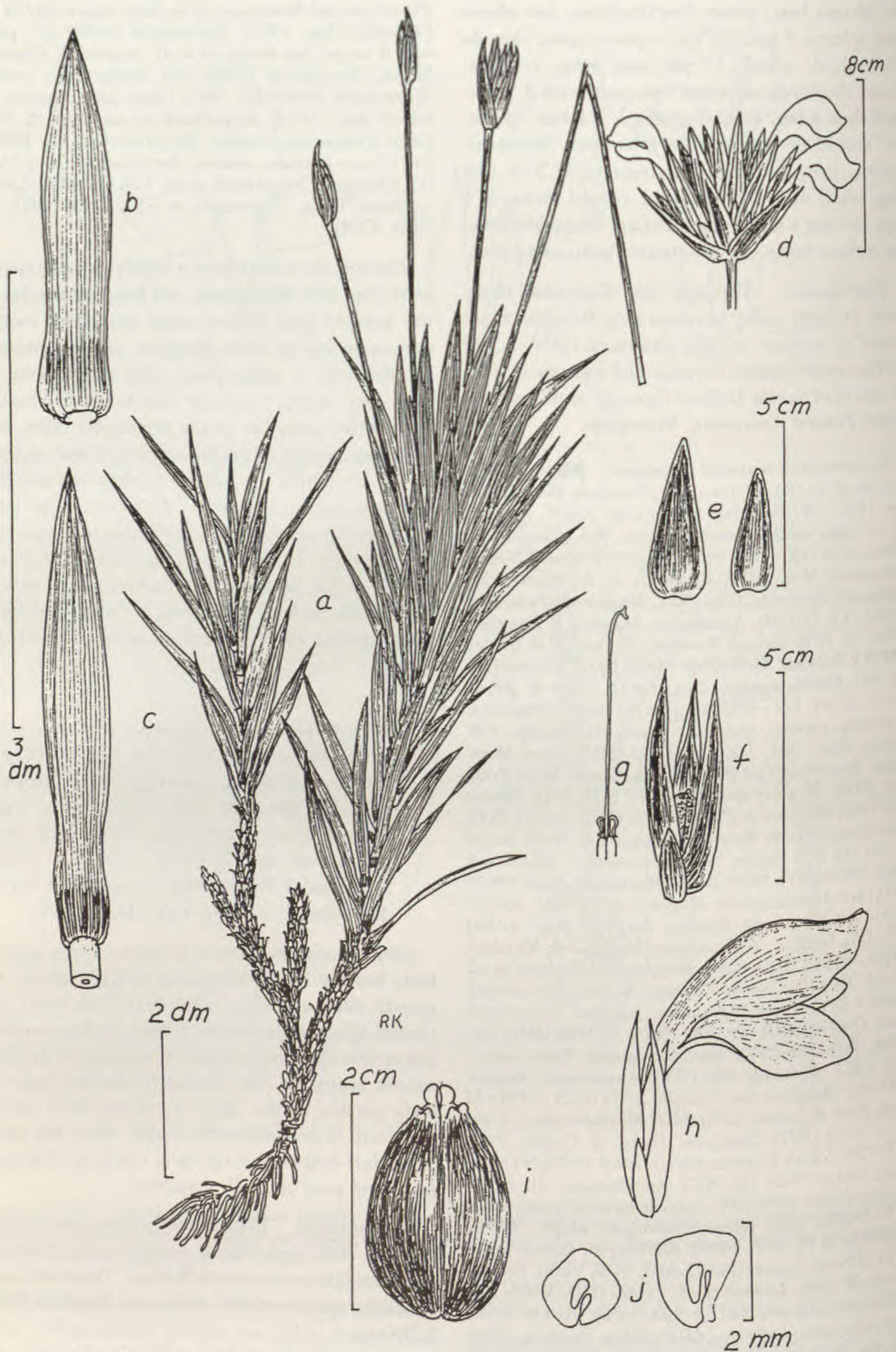


FIGURE 33. *Orectanthe ptaritepuiana* (constructed from Steyermark 59760 and Boom & Samuels 9087).—
a. Habit.—b. Cauline leaf.—c. Cauline leaf.—d. Inflorescence, natural posture.—e. Outer inflorescence bract (left);
inner inflorescence bract (right).—f. Outer view of calyx and subtending floral bract.—g. Gynoecium.—h. Flower,
natural posture.—i. Capsule.—j. Two seeds, showing size range.

(US); Murisipan-tepui, summit, *Holst et al.* 1926 (MO); Auyan-tepui, *Huber et al.* 8829 (NY, VDB, VEN); Chimantá Massif, *Huber et al.* 8889 (NY, VDB, VEN); Uei-tepui, *Huber* 10043 (MFV, VDB); Cerro Guaiquinima, *Maguire* 31761 (NY), 32786 (NY, US), 32823 (NY), 32979 (NY), 33022 (NY), 33035 (NY); Ilu-tepui, Gran Sabana, *Maguire* 33431 33467 (NY); frontier between Territorio do Rio Branco, Brazil, and Bolívar, Serra do Sol, cumbre, *Maguire* 40413 (NY); Chimantá Massif, Torono-tepui, *Steyermark & Wurdack* 523 (F, K, NY), 905 (NY), 1221 (F, NY, US); Abacapa-tepui, *Steyermark* 74927 (NY); Apacará-tepui, *Steyermark* 75885 (F, NY); Cerro Venamo, *Steyermark & Dunsterville* 92759 (GH, US); Ptari-tepui, *Steyermark* 93715 (NY); Auyán-tepui, *Steyermark* 93903 (F, NY, US); Chimantá, *Steyermark et al.* 128848 (MO); Camarcaibarai-tepui, SW shoulder, *Steyermark et al.* 132020 (MO); Chimantá Massif, *Wurdack* 34234-A (NY).

As mentioned under the discussion of *Orectanthe sceptrum*, there are intergrades between it and *O. ptaritepuiana* sufficient to tempt one to treat the two as subspecies of a common species. It remains to be explained how the dramatic extremes described by Steyermark and Maguire originated. This calls for comparative cultivation of these extremes and other experimental approaches that would demonstrate the true relationship between them. For now, it is probably best to retain the two as species.

CONCLUSIONS

In the taxonomic treatment above, four of the five genera of Xyridaceae are presented. Emphasis is given to the morphological taxonomy and to the keys in which critical differences between the genera and species are set forth. Evolutionary relationships are implied only by the circumstantial evidence given. On that basis, it may be postulated that the ancestral stock from which the existing

genera arose was (1) a rhizomatous perennial (2) with polystichous, spirally arranged leaves, (3) scapose (4) flowers in bracteate racemes, (5) with sepals and petals distinct and equal, (6) the stamens 6 and distinct, and (7) the ovary superior, tricarpellate, and with axile placentation. This sort of plant probably existed in what is now called the Guayana Highlands, the most ancient part of the New World surface geography, and from it one branch led to *Achlyphila* and *Xyris* (which share a common pollen type), and the other branch led to *Aratitiopea* and *Abolboda*, culminating in *Orectanthe*.

As mentioned in the preface, this introductory approach to the Xyridaceae is but the first part of a work that will conclude with a treatment of the known species of New World *Xyris*. This will be the last of my work with the family Xyridaceae.

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REVISION OF *COSMIBUENA* (RUBIACEAE)¹

Charlotte M. Taylor²

ABSTRACT

Cosmibuena is distinguished by its epiphytic habit, interpetiolar stipules that are also partially fused intrapetiolarly, and salverform white corollas. Four species are recognized: *C. grandiflora* (Ruíz Lopez & Pavón) Rusby, *C. macrocarpa* (Benth) Walpers, *C. matudae* (Standley) L. O. Williams, and *C. valerii* (Standley) C. M. Taylor, comb. nov. (= *Hillia valerii* Standley).

Cosmibuena Ruíz Lopez & Pavón is a genus of four species of characteristically epiphytic shrubs found throughout the moist and wet continental Neotropics. Its species are easily recognized by their succulent stems and leaves, salverform white corollas with relatively long tubes, and cylindrical woody capsules that contain numerous small glabrous seeds with thin membranaceous wings.

Species of *Cosmibuena* can be confused with those of *Hillia* Jacquin, a more speciose genus with a similar morphological aspect and geographic range (Taylor, 1989). *Hillia* can be separated from *Cosmibuena* by: their seeds, which are similar in size and form but bear a tuft of brown "trichomes" (deeply fimbriate seed wings; Robbrecht, 1988) 1–3 cm long attached at one end, in contrast to the "glabrous" seeds (with entire or only slightly fimbriate wings) in *Cosmibuena*; and by their stipules, which are interpetiolar in contrast to both interpetiolar and partially fused intrapetiolarly in *Cosmibuena*. These genera can usually also be separated by the stigmas, which are bilobed, densely papillose, and held above the anthers in *Cosmibuena*, in contrast to subcapitate, bilobed, or linear, less densely papillose, and held above or below the anthers in *Hillia*.

Several additional characteristics that have been used to separate these genera are less useful. *Hillia* has been distinguished from *Cosmibuena* by the presence of raphides in its tissues, in contrast to their absence in *Cosmibuena* (Verdcourt, 1958); however, raphides are present in all species of *Cosmibuena*. Steyermark (1974) distinguished *Hillia* from *Cosmibuena* by the lack of a marginal

wing on its seeds in contrast to a well-developed wing in *Cosmibuena*, but *Hillia* seeds show at least a thin marginal wing while those of *Cosmibuena* are variable. In his key to genera Standley (1938) separated these taxa based on the persistent calyx of *Hillia* in contrast to the deciduous calyx of *Cosmibuena*, although in his text he described the calyx of *Hillia* as absent or having the lobes "caducous"; Schumann (1891) and Wernham (1916) contrasted the caducous calyx of *Hillia* with the persistent calyx of *Cosmibuena* for this same distinction. Actually, persistence of the calyx limb varies in both genera and among individuals of some species, or the calyx limb may not develop at all, as in several species of *Hillia*. Standley (1938) also distinguished these two genera by the presence of a well-developed calyx tube in *Cosmibuena*, in contrast to a completely divided calyx limb (when present) in *Hillia*; however, that distinction does not apply to *C. valerii* (Standley) C. M. Taylor, which has a completely divided calyx limb. Dwyer (1980) separated these genera in Panama based in part on width of the leaf blades, but this distinction is invalidated here by the inclusion of *C. valerii*, which has narrow leaves, and was never useful outside of Panama, where species of *Hillia* with larger leaves are found.

TAXONOMIC HISTORY

Cosmibuena was originally described by Ruíz Lopez & Pavón (1794) in their *Prodromus*. The name commemorates Cosme Bueno (1711–1798), a professor of medicine, mathematics, and cos-

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mology at the University of San Marcos in Lima (Steele, 1964), and was originally applied to a species of *Hirtella* Linnaeus (Chrysobalanaceae). However, in their subsequent *Flora*, Ruíz Lopez & Pavón (1802) applied the name to a different species, a succulent member of the Rubiaceae they had previously treated in the *Prodromus* as *Cinchona grandiflora*. Ruíz Lopez & Pavón now treated the rubiaceaceous species under a new, illegitimate name, *Cosmibuena obtusifolia*. Their use of *Cosmibuena* in the first sense was followed by most nineteenth-century authors, who therefore placed their rubiaceaceous species in *Buena* Pohl (e.g., Bentham & Hooker, 1873; de Candolle, 1830; Bentham, 1839, 1844). Unfortunately, *Buena* Pohl is an illegitimate later homonym of *Buena* Cavanilles, which is rubiaceaceous but does not include the species of Ruíz Lopez & Pavón. Their species and its congeners were subsequently transferred from *Buena* Pohl to Ruíz Lopez & Pavón's second (1802) illegitimate *Cosmibuena* by Klotzsch (1846) and Schumann (1891). By this time *Cosmibuena* in its first sense had been relegated to synonymy and thus practically, though not formally, rejected, although it still existed for purposes of priority. Thus, the rubiaceaceous plants lacked a legitimate name for more than a century. This problem was recognized but not addressed by Standley (1921), who used the name *Cosmibuena* in all of his works (Standley, 1921, 1930, 1931a, b, 1938). The conservation of *Cosmibuena* in Ruíz Lopez & Pavón's second, rubiaceaceous sense finally resolved this situation (Monachino, 1949; Lanjouw et al., 1956).

The first treatment of the entire genus was presented by de Candolle (1830), who recognized three species, one of which is today treated in *Ladenbergia*. Subsequent outlines of the genus were presented by Klotzsch (1846), Bentham & Hooker (1873), and Schumann (1891). Aside from these works, treatments of individual species have been presented in regional floras, notably by Standley (1921, 1931a, b, 1938), Standley & Williams (1975), Dwyer (1980), Croat (1978), and Steyermark (1974). *Cosmibuena* has not been treated comprehensively since de Candolle's work, although Monachino (1949) presented a perceptive conspectus of the genus that has been followed by more recent authors (Standley & Williams, 1975; Dwyer, 1980).

RELATIONSHIPS OF *COSMIBUENA*

Cosmibuena has been classified by most workers in the tribe Cinchoneae of the subfamily Cinchonoideae (Schumann, 1891; Bremekamp, 1966;

Robbrecht, 1988; Lorence, 1990; Andersson & Persson, 1991). Twentieth-century authors (Bremekamp, 1966; Robbrecht, 1988; Kirkbride, 1982) cite a lack of raphides as a characteristic of this tribe and subfamily, but most have apparently overlooked the presence of raphides in *Cosmibuena* (e.g., Bremekamp, 1966; Robbrecht, 1988; Lorence, 1990). Based on its raphides, Kirkbride (1982) removed *Cosmibuena* to the previously monogeneric *Hillia* of the subfamily Rubioideae. Bremekamp (1966) originally removed *Hillia* from the Cinchoneae based on its raphides and "comose" seeds, which are unique in the family. *Cosmibuena* has "glabrous" seeds, but this character was discounted by Kirkbride in favor of similarities of habit and general aspect.

Some species of *Hillia* are similar to those of *Cosmibuena*, as discussed above. However, *Cosmibuena* shares with *Ladenbergia* and other genera of Cinchoneae several features not found in *Hillia*, including intrapetiolarly partially fused stipules and stigma morphology. The combinations of characters found in these genera suggest that the similarity of habit and morphology between *Hillia* and *Cosmibuena* may be convergent, and that raphides may not be a reliable tribal character (Robbrecht, 1988; Andersson & Persson, 1991). A detailed analysis of the relationship between these genera depends on a modern study of *Hillia* currently underway (Taylor, 1989, in prep.).

Separation of *Cosmibuena* and *Hillia* was clearer before the discovery of *Cosmibuena valerii* (Standley) C. M. Taylor. Previously, in addition to the characters discussed in the introduction, these genera could be separated by their corolla aestivation, which was imbricate in *Cosmibuena* in contrast to convolute in *Hillia*; flower number, which was 3–11 in a cymose arrangement in *Cosmibuena*, in contrast to solitary (with one clearly derived exception, Taylor, 1989) in *Hillia*; the development of a tubular calyx limb in *Cosmibuena*, in contrast to a completely divided or (frequently) absent calyx limb in *Hillia*; and interpetiolarly and partially intrapetiolarly fused stipules in *Cosmibuena*, in contrast to only interpetiolar stipules in *Hillia*. However, *Cosmibuena valerii* has convolute corolla aestivation, solitary flowers, a completely divided calyx limb, partially intrapetiolarly fused stipules, elliptic, flattened, densely papillose stigmas, and "glabrous" seeds. This species is here classified in *Cosmibuena* based on its seed, stigma, and stipule characters. Convolute and imbricate corolla aestivation are both found in the Cinchoneae (Robbrecht, 1988), and thus the distinction between these conditions seems less im-